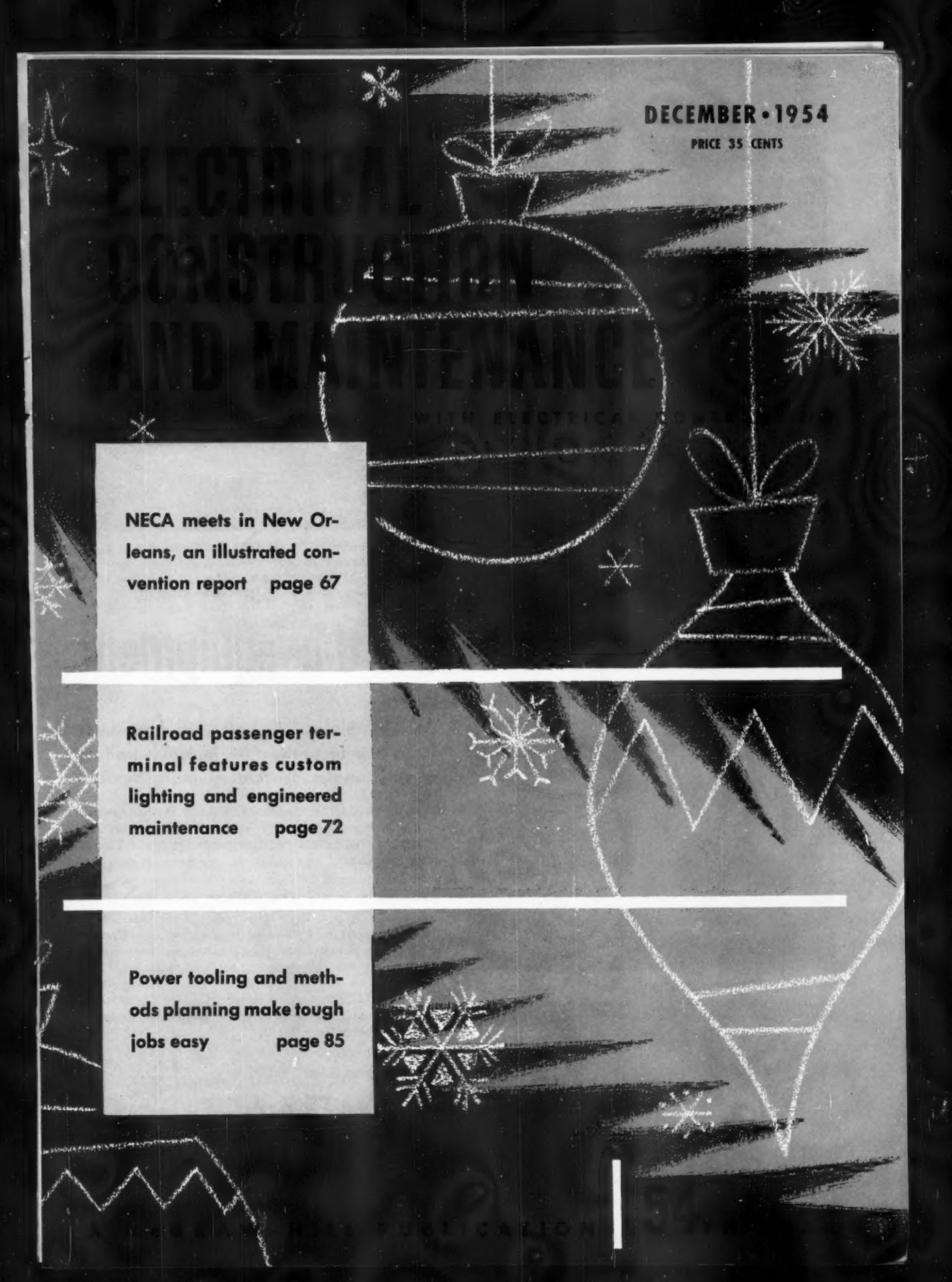
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PRICE 35 CENTS
ELECTRICAL CONSTRUCTION AND MAINTENANCE
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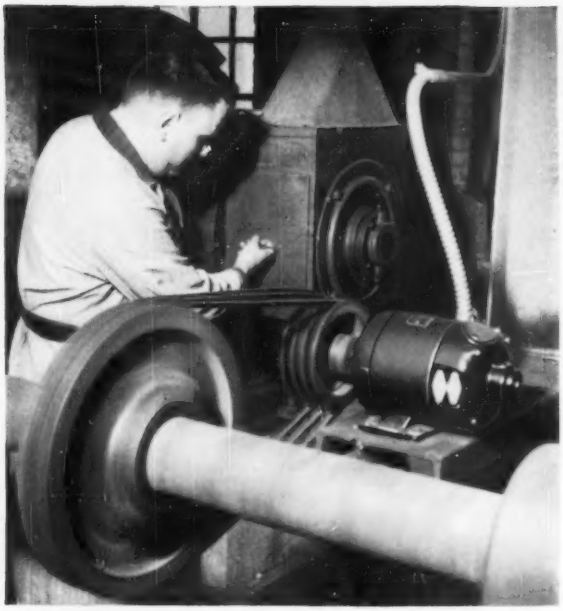
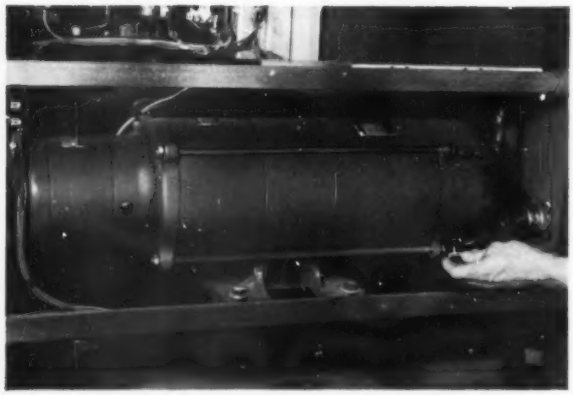
1 INCREASE EQUIPMENT FLEXIBILITY. G-E d-c fhp motors are excellent for machines that require variable speed to meet changing requirements. Here, blade speed is adjusted depending on hardness of metal being cut.



2 IMPROVE PRODUCT QUALITY. G-E tachometer generators accurately measure rotational and linear speed on equipment such as processing machines and conveyors where product quality depends on precise speed control.

Save 3 ways with G-E d-c equipment



3 SIMPLIFY PROCESS CONTROL. G-E amplidynes are simple and compact, yet provide fast, accurate control of current, voltage, speed, tension, or position. They're used on a variety of process equipment plus machine tools.

General Electric's small d-c equipment helps step up production, improve product quality, make machinery more flexible

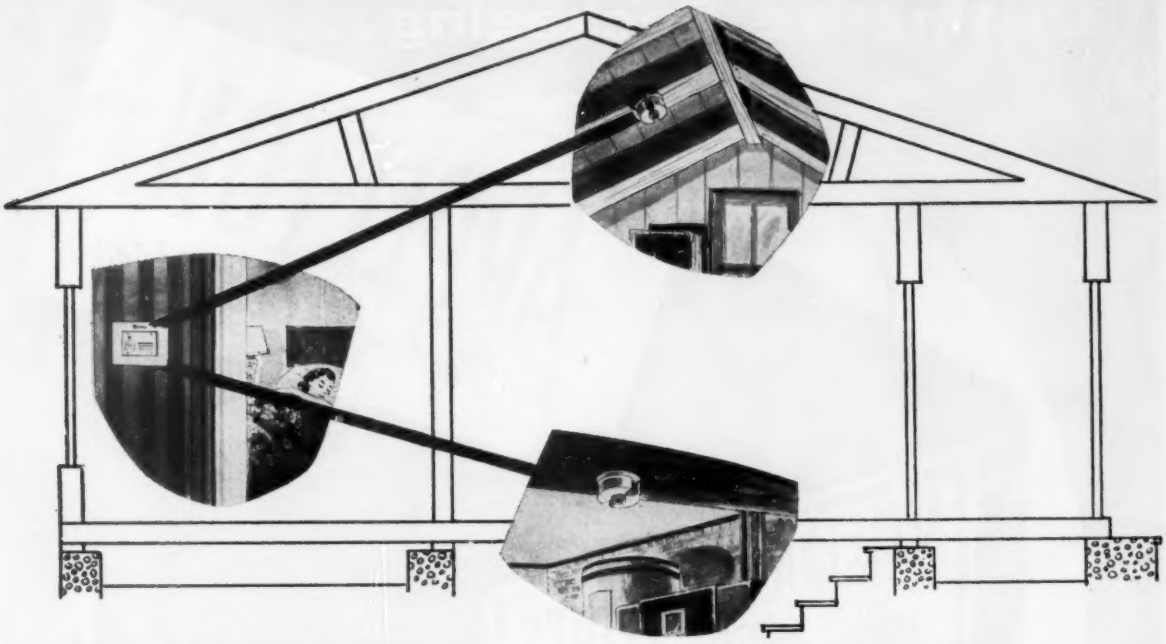
Today's production machines demand flexible control of speed, torque, acceleration, and deceleration . . . flexibility that only d-c equipment can provide. That's why one out of ten industrial machines is now d-c powered.

GENERAL ELECTRIC APPLICATION ENGINEERS stand ready to help you take advantage of the benefits of d-c equipment and to assist you in the selection of d-c motors and equipment best suited for your needs. To arrange for this help . . . and for additional information on d-c equipment as shown . . . contact your local G-E Apparatus Sales Office or Distributor today. Or write General Electric Company, Section 704-13, Schenectady, N. Y.

Progress Is Our Most Important Product

GENERAL ELECTRIC

Terrific new chance for extra profits...

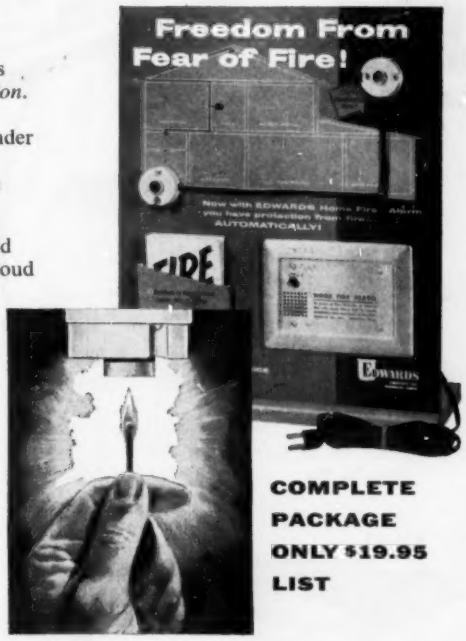


EVERYBODY'S a prospect for the NEW EDWARDS HOME FIRE ALARM!

Here's one product everybody you deal with should have — the new Edwards home fire warning system. Why? Because it offers something everybody wants and needs — *permanent fire protection.* Remember — over 300,000 homes had fires last year. 5,000 people died from home fires — over a thousand, children under five years old. Point out these facts to your prospects. Tell them that in most fires it's the first five minutes that count — that the Edwards Home Fire Alarm can save a life, a home.

Show your customers how the Home Fire Alarm works. Just hold a match under one of the two detectors on the display . . . hear the loud clear alarm sound off. Show them how they can test the system any time by just pressing the test button. Explain that you install the detectors in furnace area and attic. That they sound the alarm when the temperature rises above 140°F. . . . UL approval means they are sure to work. Show your customers how the system uses low cost, quickly installed bell wire . . . that it's fool proof, automatic, never needs servicing or adjusting.

Here is the hottest new salesgetter in the residential field. Cash in . . . now!



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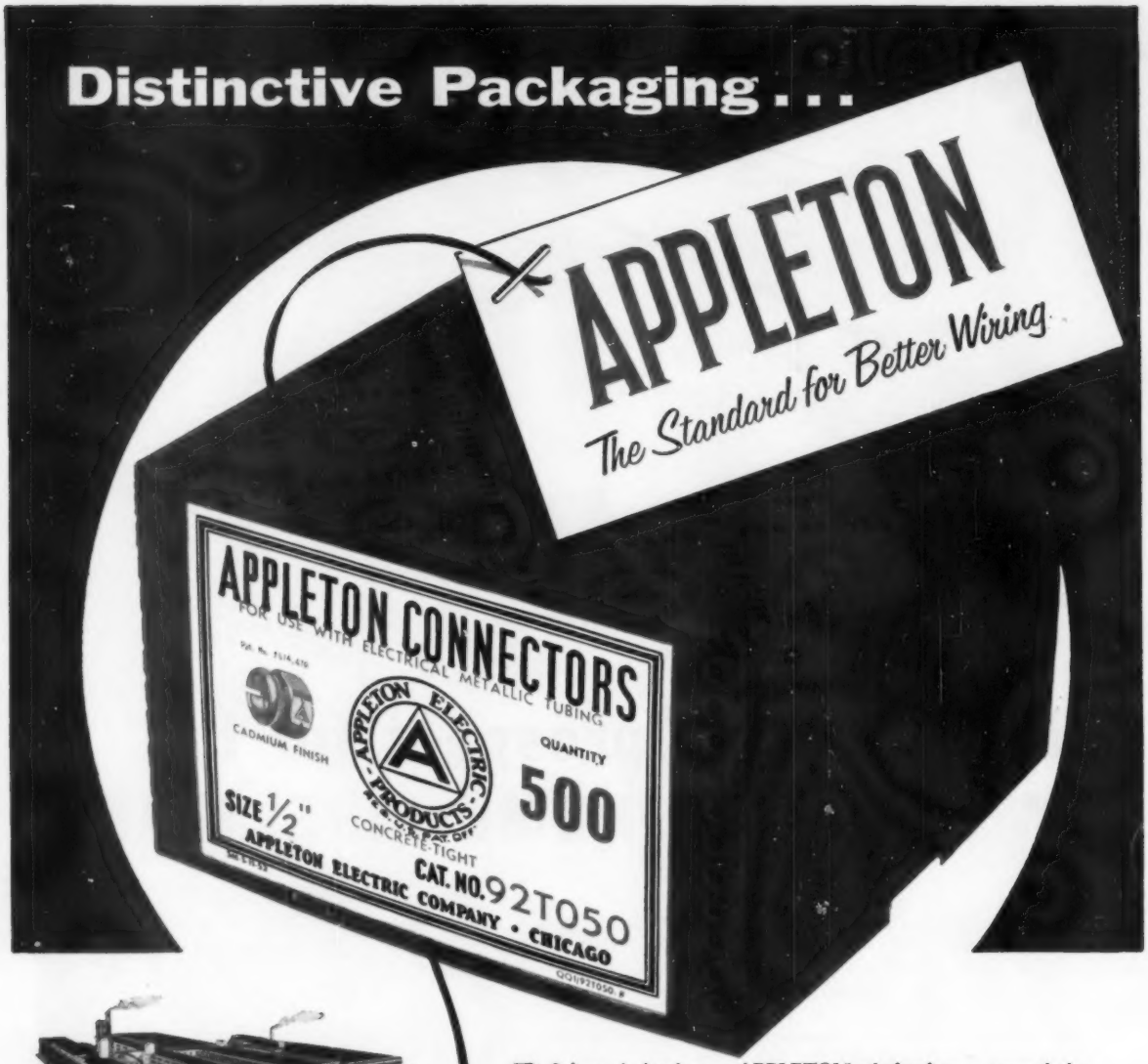

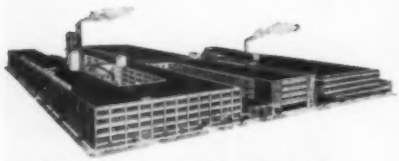

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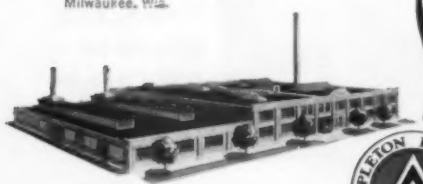
Foundry Division, Plant No. 2, Milwaukee, Wis.



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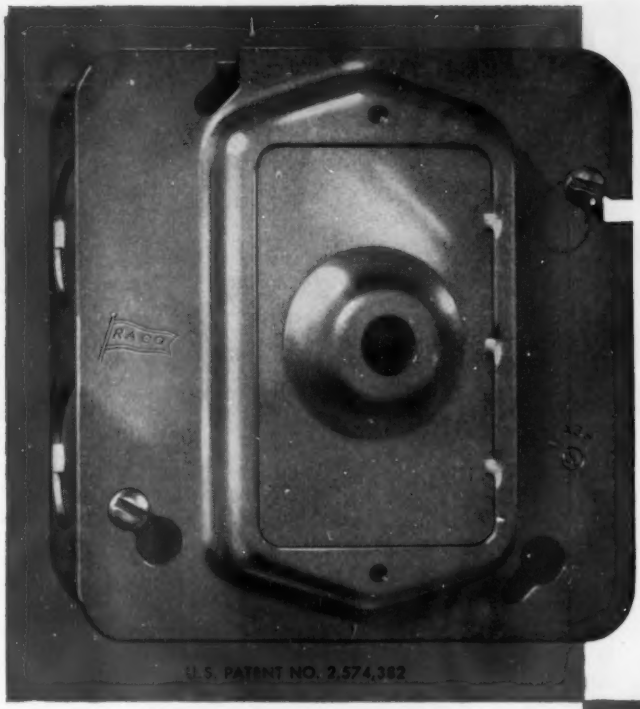


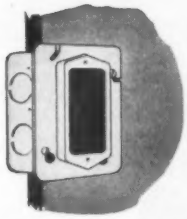
NEW RACO LOCATOR COVER

MAKES IT EASY TO FIND OUTLET BOXES IN NEWLY PLASTERED WALLS

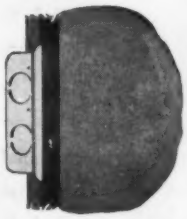
COMPARE THE COSTS PER OPENING!

No. 788—½" Raised • No. 789—¾" Raised

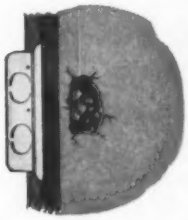
THE OLD WAY cost—dollars



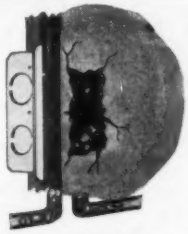
Box and device ring installed ready for the plasterers. Opening is unprotected. Location is unmarked.



Plastering completed. Some boxes may be completely covered by plaster.

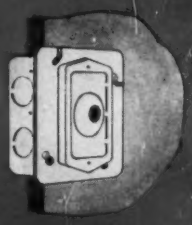


Box located by tapping or painting wall with water. Plaster fragments fill box and conduit. Plaster cracks.

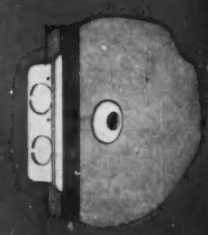


Both box and conduit must be cleaned. This is time consuming and costly. Plaster requires patching.

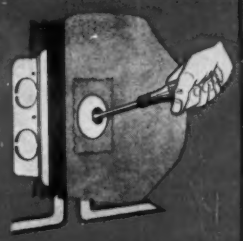
THE NEW RACO WAY cost—pennies



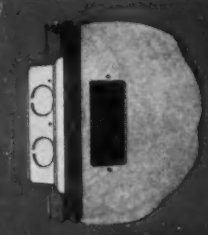
Box and device ring with Raco Locator KO are installed. Opening is protected and location is marked.



Plastering completed. Box hidden by plaster. Locator is easily found.



A screwdriver in Raco Locator KO is bent back and forth. Excess plaster breaks cleanly. Box is free of debris.



Plaster edges are clean and sharp. Wiring and device installation can be done at once. No plaster problems.

Get complete information on RACO Locator Covers

WRITE TODAY!

RACO

ALL-STEEL EQUIPMENT INC. AURORA, ILLINOIS

You can always depend on RACO

CROUSE-HINDS EV Series

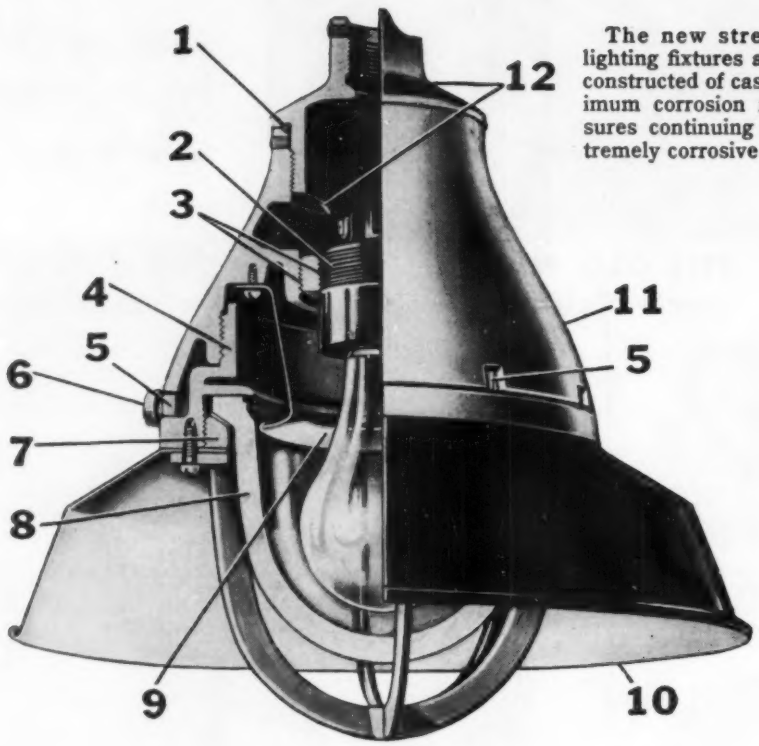
have been redesigned to give you:

EASIEST installation

EASIEST maintenance

HIGHEST efficiency

This adds up to big savings on every installation!

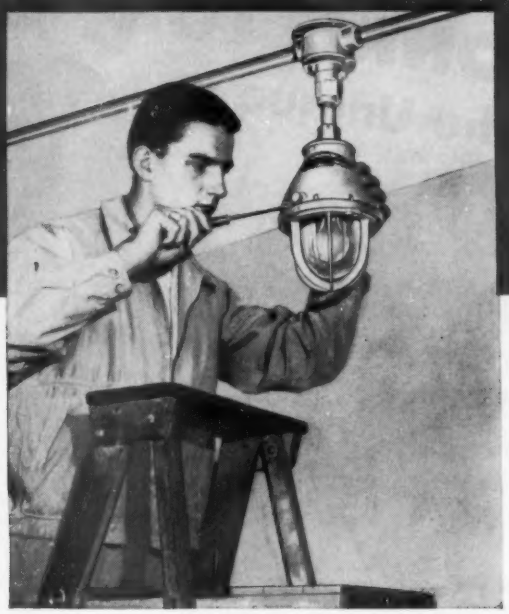


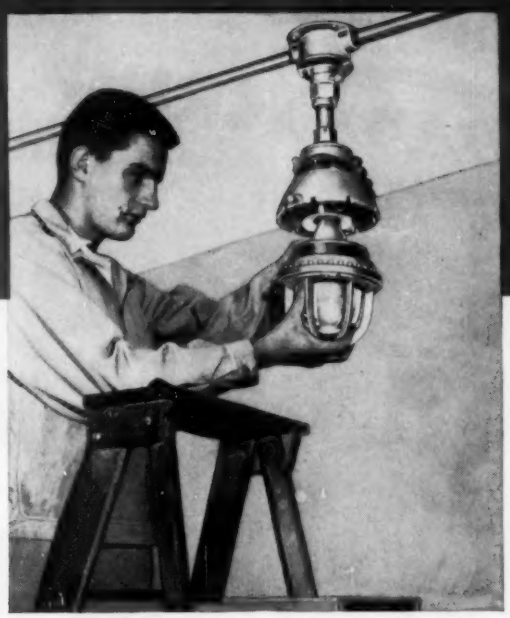
The new streamlined EV lighting fixtures are completely constructed of cast metal. Maximum corrosion resistance insures continuing safety in extremely corrosive locations.

1. Rubber O-ring gasket . . . seals joint against dirt or liquids.
2. New improved shock-absorbing receptacle has "universal" action . . . absorbs shock from *any* direction.
3. Threaded joints are flame tight . . . no sealing compound or external seals are required.
4. Lightweight one-piece assembly of globe, holder, guard and reflector is threaded high up inside of hood . . . no liquid or dirt can enter.
5. Notches in hood and globe holder . . . easy to loosen with a screwdriver.
6. Large knurled thumb screw . . . sets between notches for positive locking.
7. Globe retaining ring and cushioning gasket.
8. Heat and impact resisting globe. The accurately ground flange, essential for safety, is protected in a factory assembled joint . . . never exposed to damage.
9. Auxiliary reflector . . . etched Alzak aluminum . . . eliminates "trapped" light.
10. Porcelain enameled steel reflector.
11. Cast aluminum hood.
12. Cast aluminum body . . . has two openings for easier wiring from either side.

CONDULETS · AIRPORT LIGHTING

Explosion-Proof LIGHTING FIXTURES





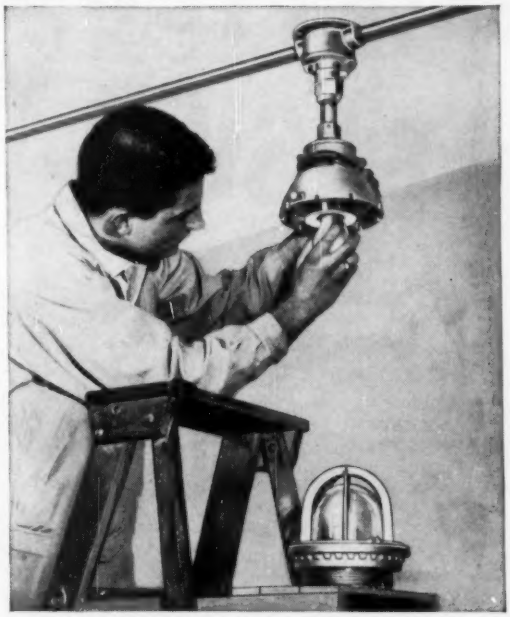
Easiest Relamping—3 Simple Steps

1. Single unit globe-holder assembly threaded into fixture hood is quickly removable for relamping. Slots are provided for prying with a screw-driver when necessary in corrosive atmospheres or other severe conditions. A large knurled thumb screw is easily loosened to unlock the globe and holder.

2. Globe and holder complete with guard (and reflector if used) is removed as an assembly. Only one lightweight piece to handle—globe retained in holder with flame-tight joint fully protected. Explosion-proof integrity assured. The 200/300-watt globe-holder assembly weighs but 8 lbs.

The new design of EV Explosion-Proof Lighting Fixtures is based on exhaustive studies and tests in Crouse-Hinds laboratories. The goal was to produce a fixture that would be easier to install and easier to relamp than any other explosion-proof fixture. Crouse-Hinds designers not only achieved this result but also created a fixture having the highest possible lighting efficiency.

You get 3-way savings when you install Crouse-Hinds EV Lighting Fixtures: quicker installation; quicker relamping; more light. This makes them the best buy for lighting in any location that is hazardous because of the possibility of the presence of flammable atmospheres. Use them on every job and have the best!



3. In relamping only a lamp is carried up and down the ladder and one assembly handled. It is not necessary to stock any spare parts or assemblies for complete convenience.

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- Insulates All Around Joint and Between Wires
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- Insures Complete Safety — Deep Skirt Completely Covers the Bare Conductor, Even When Wires are Not Stripped Evenly
- No Extra Tool Required

*Patented, No. RE 22649 and other patents pending.

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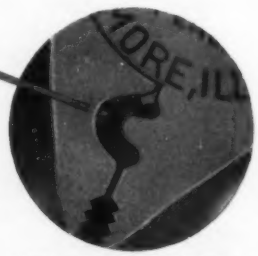
NO EXTRA TOOL TO CARRY



Crimping die makes double indentation—gives sleeve stronger gripping action.

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Both Sleeve and "Wrap-Cap" Insulator Listed by Underwriters' Laboratories, Inc., for General Use (600 V.) in Branch Circuit and Fixture Wiring.

NOW simplify and improve all your crimp connections with a connector that is stronger—has an entirely new and better kind of insulator—and is far easier to use!

The IDEAL Crimp Connector gives you the joints that are actually better insulated than the wire itself. It completely eliminates the chance of shorts or "burn-throughs"—insures a pre-fabricated insulating job that never varies.

THE IDEAL CRIMP SLEEVE

(Patent Pending)

Makes a joint that is vibration-proof, never crystallizes and has very low electrical resistance. Made of cadmium plated steel, it insures higher holding power than any other crimp connector used for pigtail splices. Approved as pressure cable connector for general use in all branch circuit combinations from No. 14 through No. 10 and for fixture hanging.

CATALOG No. 30-410...In cartons of 1000 (packed in boxes of 100)

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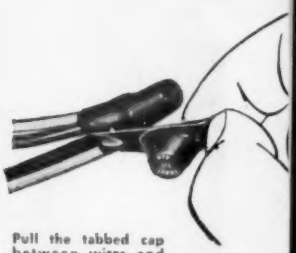
THE "Wrap-Cap"

Made of the same vinyl material used on TW wire, the "Wrap-Cap" Insulator is the first to insulate all around the joint and *between* the wires. With a snug-fitting, extra-deep skirt, the "Wrap-Cap" cannot come off or roll back even when the wires are pulled apart at right angles to the joint. It has excellent ageing characteristics and resists corrosive atmospheres, sunlight, water—even gasoline!

While primarily intended for use with IDEAL Crimp Sleeves, the "Wrap-Cap" is an all purpose insulator. It is far easier to use than any tape and also provides perfect insulation for other uninsulated connectors including soldered joints, crimp sleeves, etc.

CATALOG NO. 30-415...In cartons of 1000 (packed in boxes of 100)

Push "Wrap-Cap" down over sleeve.



Pull the tabbed cap between wires and over end of joint.

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with the Double - Indent Crimping Die

A precision-made tool so handy and useful you'll want it for all kinds of jobs besides making IDEAL Crimp Connections. New England nose easily gets into hard-to-reach places, is exactly right for twisting wires and burring conduit. Pliers are only 9 inches long—fit into pocket or holster.

The single crimping die, for use with IDEAL Crimp Connectors, is located at the point of maximum leverage for easiest crimping. Die makes a double indentation that makes the copper in wires cold-flow in all directions to give an exceptionally strong mechanical joint.

Special plastic grips provide a comfortable, powerful hold—are non-burning and non-explosive. Pliers are unconditionally guaranteed against defects in workmanship and material.

CATALOG No. 30-420

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	ITEM	QUANTITY	PRICE
CAT. NO. 30-410	Sleeves, in cartons of 1000 (packed in boxes of 100)	_____cartons	$8.00 per 1000
CAT. NO. 30-415	"Wrap-Caps" in cartons of 1000 (packed in boxes of 100)	_____cartons	$16.00 per 1000
CAT. NO. 30-420	Electricians Pliers	_____	$4.25 ea.

We understand this order will be shipped through our IDEAL Distributor, whose name and address is_____

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☐ Send only catalog data at this time.

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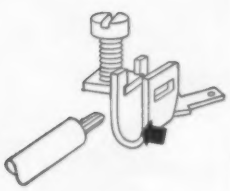
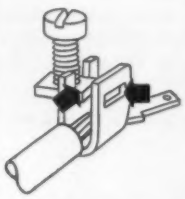
Faster, easier wiring with BRYANT 30 and 50 ampere heavy duty receptacles

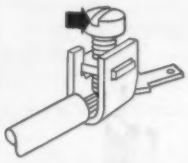
No. 3845 FEATURES BRYANT EASY-TO-WIRE PRESSURE TERMINALS



Lay wire in open channel



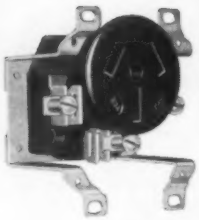
slide pressure screw assembly in opposite slot



tighten pressure screw

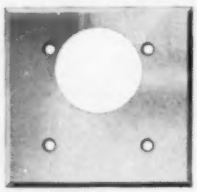
This Bryant Flush Mounting Range and Power Receptacle with new Pressure Terminals is easier to wire ... more satisfactory to your customers. With these pressure terminals—

- ... there are no loose parts to mislay
- ... the screw assembly is permanently attached to the wiring channel
- ... rounded channel confines wire strands
- ... the assembly terminals are cadmium-plated for either copper or aluminum wire



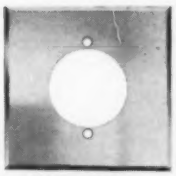
No. 3845
3-wire
50 Amps. 250 Volts
For separable range installations and heavy-duty equipment such as steam tables, welding machines.

- Rugged plastic body
- Fits standard 4" and 4 11/16" boxes.

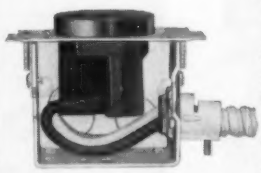


No. 3844
Stainless Steel Plate

No. 9301
Stainless Steel Plate
1 gang, single opening



No. 9302
Stainless Steel Plate
2 gang, single opening



J-99919

No. 9303
3-wire, 30 Amps. 250 Volts
This flush mounting outlet is the only device of its type that can be mounted in a single gang box (see photo). Can also be mounted in 4 or 4-11/16 inch square boxes with plaster cover raised ½ inch or more. Equipped with clamp type pressure terminals for easy wiring.

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SUPERIOR WIRING DEVICES

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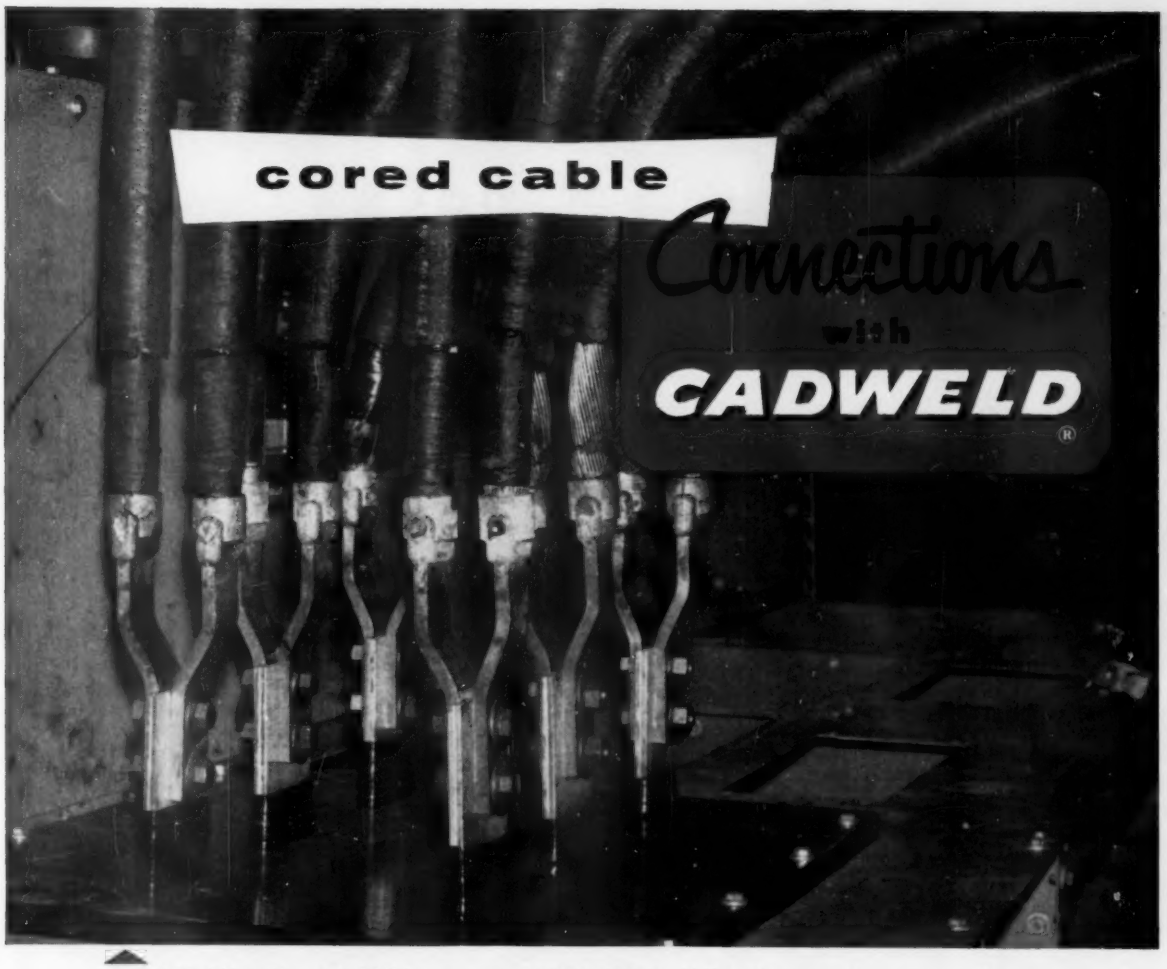

1,250,000 CM cable with ¾" hemp core CADWELDED to ½" x 2" copper bar lugs at the Ashtabula power plant of The Cleveland Electric Illuminating Company.

CADWELD CONNECTIONS are the best on any type of cored cable because:

1 They do not require mechanical pressure for contact.

2 They cannot loosen or corrode.

3 They have greater current carrying capacity—keeps connections operating cooler than the cable.

4 They are compact—simplifies reinsulation.

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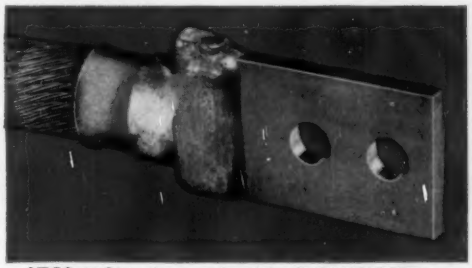
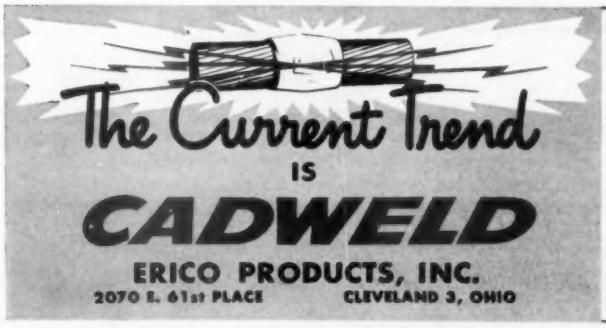


1750 MCM air cored cable CADWELDED to ½" x 3" x 8" lug



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2070 E. 61ST. PLACE CLEVELAND 3, OHIO

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Youngstown is the one manufacturer who makes rigid steel conduit from ore to finished product. This enables Youngstown to control the complete manufacturing process—your insurance that each length of "Buckeye" is made of top-grade steel.

Youngstown

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Profits unlimited, tremendous sales potential. There are hundreds of money-making opportunities all around you to sell Exide Lightguard emergency lighting protection! Everywhere people gather there is a possible sale for Exide Lightguards. Send coupon now for full details.

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Model M, double lamp unit

THE ONLY COMPLETELY AUTOMATIC EMERGENCY LIGHTING UNIT ON THE MARKET!

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Lighting protection is needed for:

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get the
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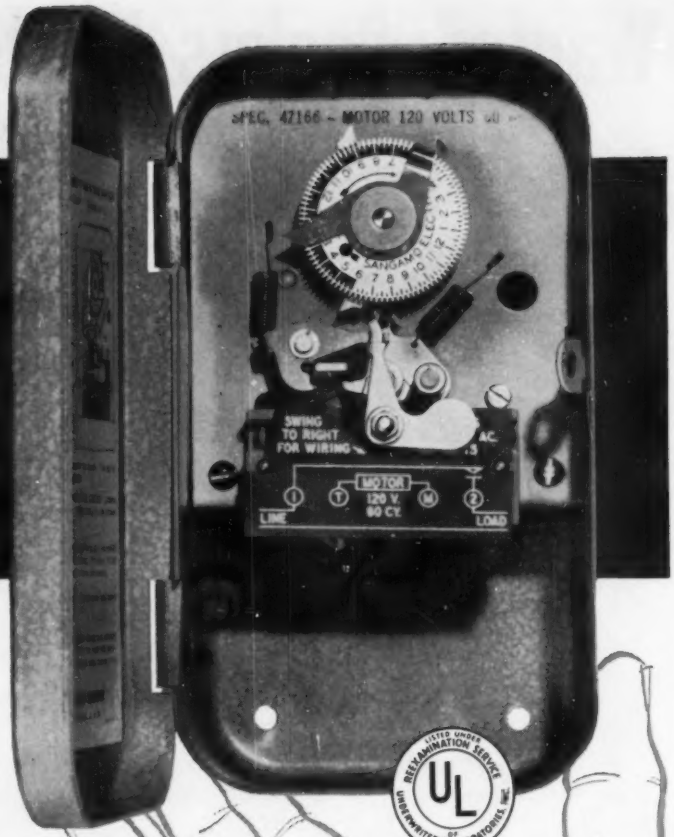
It's Profitable to install a SANGAMO TIME SWITCH



You never get through paying for <u>some</u> time switches.
Even if your books have been closed on a time switch job for some time—if you have to make just one service call, you've lost your profit on that switch.

With the Sangamo Type B Time Switch, there's . . .
NO SERVICE CALL HEADACHE—The Sangamo Type B is powered by the famous Sangamo 450 r. p. m. hysteresis motor. This motor is lubricated for life, operates quietly, and keeps working under wide temperature variations.

Minimum-arc design, solid silver contacts and special wear-resistant bearings at points of greatest wear give the Sangamo Type B Time Switch longer service life.

THE SANGAMO TYPE B IS EASY TO INSTALL—
You save on the Sangamo Type B—and profit, too—because it's easy to install. Almost half the inside space is available for fast, convenient wiring and there are four handy, multiple knockouts, ½" to ¾" in diameter.

You can take pride in the installation of a Sangamo Time Switch because it is the finest time switch on the market. Your reputation for thorough, conscientious work is safe-guarded.

IF YOU'RE LOOKING FOR THE BEST IN A HEAVY-DUTY TIME SWITCH...

For automatic control on installations that require more than a single-pole, single-throw switch can offer—choose a Sangamo Heavy Duty Time Switch. This model is available with an *Automatic Carryover* which assures continued operation for up to 10 hours in the event of a power failure . . . an *Omitting Device* which can be set to omit operations for one or more 24-hour periods. Or you can order the heavy-duty switch with an *Astronomic Dial* which automatically controls the switching schedule in accordance with the sunrise and sunset.

* Your electrical wholesaler can furnish you with all types of dependable Sangamo Time Switches. Insist on Sangamo—for the best in time switch performance.

ST54-7

SANGAMO ELECTRIC COMPANY
SPRINGFIELD, ILLINOIS

It takes Six Bolts –

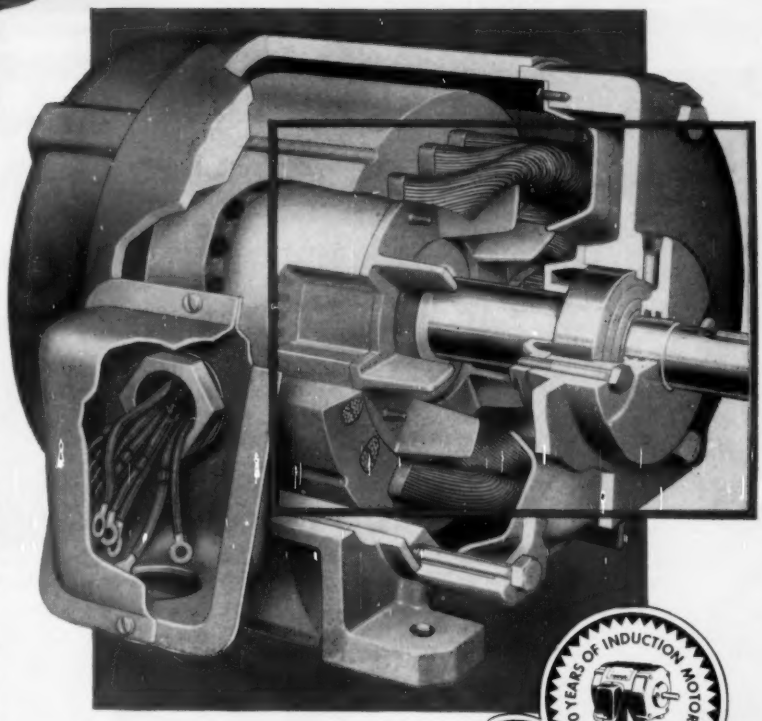
not just four

to give full bearing protection for greater motor performance

THE TWO EXTRA BOLTS in the end housing of every Allis-Chalmers ball bearing motor are the proof of *extra* protection against bearing failure. These are the bolts that hold the bearing cap tightly in place against the inner face of the bearing enclosure. This cap, with its close running clearances, keeps grease from the interior of the motor . . . retains an ample supply within the bearing enclosure . . . protects the grease and the bearing against contamination from dirt and moisture.

At the outer side of the bearing, double labyrinth seals keep grease in, also keep dirt out. What's more, large grease reservoirs act as additional dirt traps.

Result? Allis-Chalmers motors pay off in longer, trouble-free bearing life, lower motor maintenance.



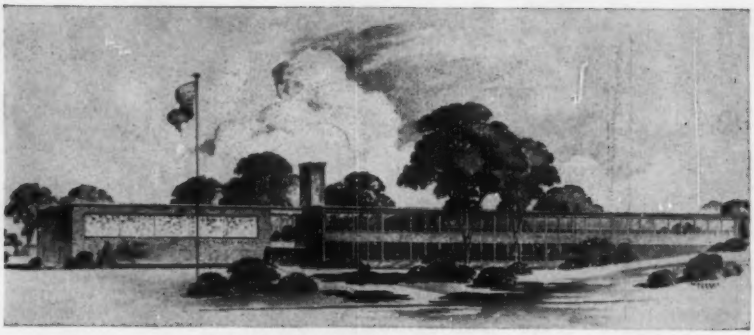
50 YEARS OF INDUCTION MOTORS
ALLIS-CHALMERS-NORWOOD WKS.

Get all the facts . . . judge for yourself — Compare Allis-Chalmers motors with other motors. Get the six-bolt construction that gives you complete bearing protection. For proof, see your Allis-Chalmers Office or Authorized Distributor, or write — Allis-Chalmers, Milwaukee 1, Wisconsin.

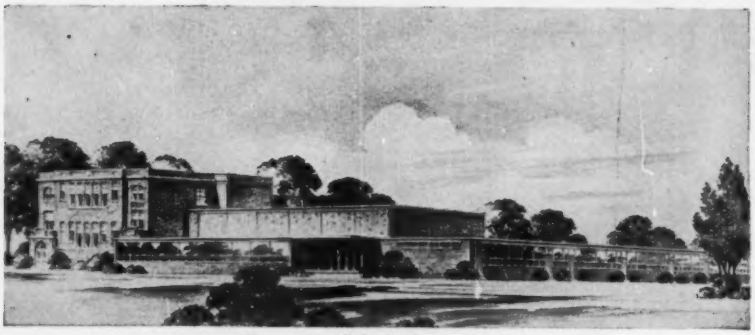
ALLIS-CHALMERS

A-C ALLIS-CHALMERS

A-4443



Holy Family School, Watertown, N. Y.



Gansevoort School, Rome, N. Y.

REPUBLIC "INCH-MARKING"

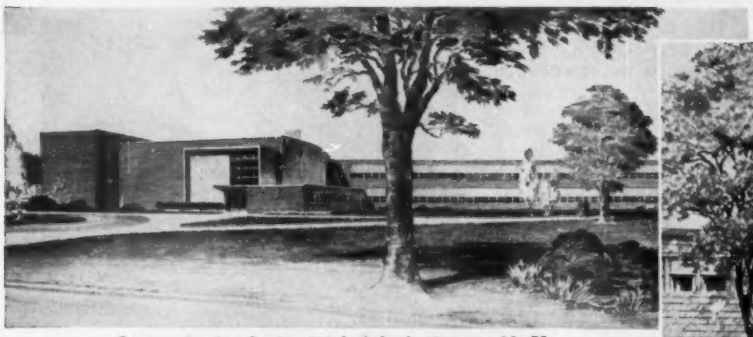
Knickerbocker Elementary School, Watertown, N. Y.

Beaver River Central School, Beaver Falls, N. Y.

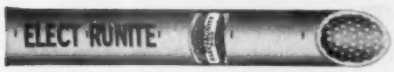
Norwood-Norfolk Junior-Senior School, Watertown, N. Y.

Architect, all schools and housing project: Sargent, Webster, Crenshaw & Folley, Syracuse, N. Y.

Electrical Contractors, housing project and all schools except Norwood-Norfolk Junior-Senior High: Barber Electric Co., Inc., Watertown, N. Y.; Norwood-Norfolk Junior-Senior High School: Shelly Electric, Inc., Potsdam, N. Y.



Canton Junior-Senior High School, Canton, N. Y.



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Exclusive "Inch-Marked" lengths are easier to cut accurately. You measure the distance, not the tubing. Using the ELECTRUNITE Calibrated Bender, journeymen can make smooth, accurate bends.

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"INCH-MARKED" THE MARK OF QUALITY

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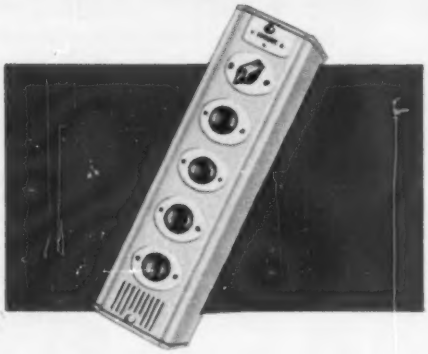
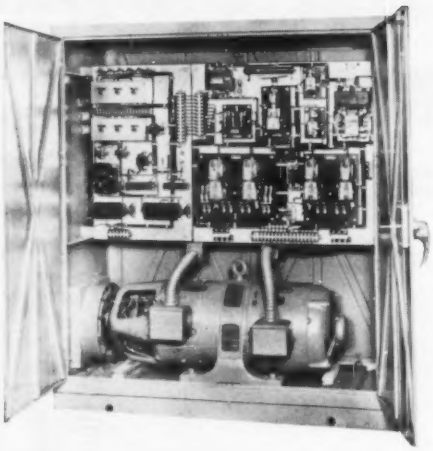
with a Performance Rated® Century SELECTIVE SPEED DRIVE

- **Offers automatic control integrated with your process.**
- **Covers a wide speed range—forward or reverse.**
- **Starts, stops—fast or slow.**
- **Allows forward or reverse jogs.**
- **Controls one or more motors.**

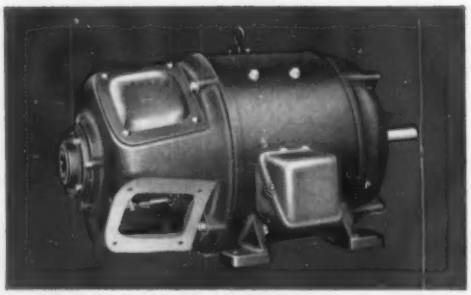


With a Century Performance Rated Selective Speed Drive, you can often integrate speed changes to cycle automatically as the process requirements dictate.



- You can automatically regulate metal cutting for optimum cutting speeds.
- Make the speed change automatically sensitive to changing temperature or pressure.
- Make the speed change automatically sensitive to changing diameter of a feed roll.
- Make the speed change automatically sensitive to the viscosity of a mix.
- You can use many different kinds of control devices in the control circuit to change speeds ... to jog ... to apply dynamic braking, etc.

You're welcome to full information on your specific drive problem. Call your nearest Century District Sales Office or Century Authorized Distributor, or write direct. See telephone listings.



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1/8 to 400 H. P.

Century C MOTORS

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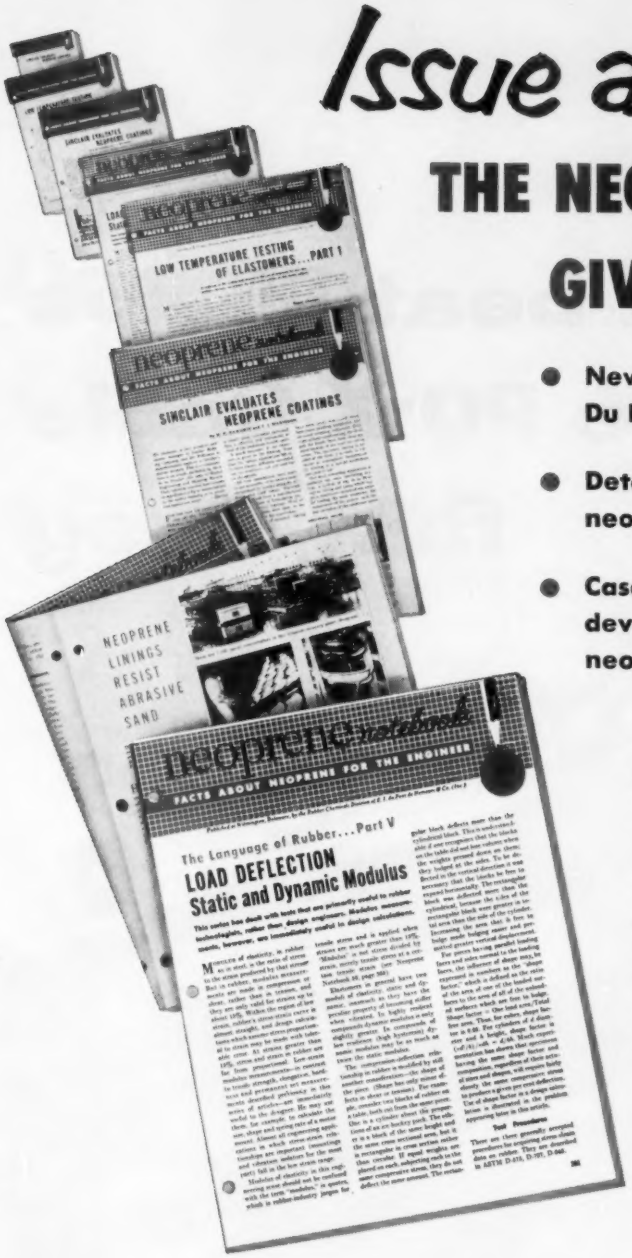
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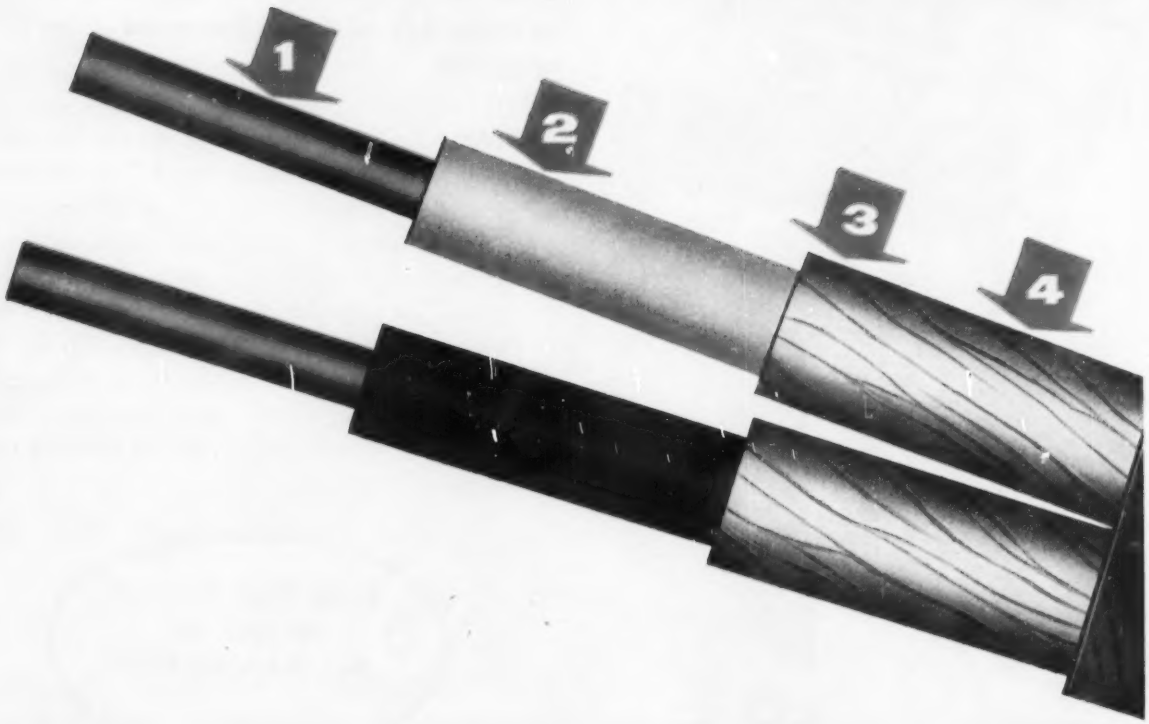

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Phelps Dodge Copper Products Corporation's dependable PD-X cable is the fastest-stripping, cleanest-working nonmetallic-sheathed cable on the market today. Here's why:

1. Copper conductors are *soft* drawn. Connections are easily and quickly made.
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5. Barrier tape keeps exterior finishing compounds out of the cable—leaves inside clean and free of gum. *Strips off cleanly as a unit with outer braid covering.*
6. Clean, grey finish eliminates sticking, *assures easy pulling*, clean walls and hands.

See Your Phelps Dodge Distributor!

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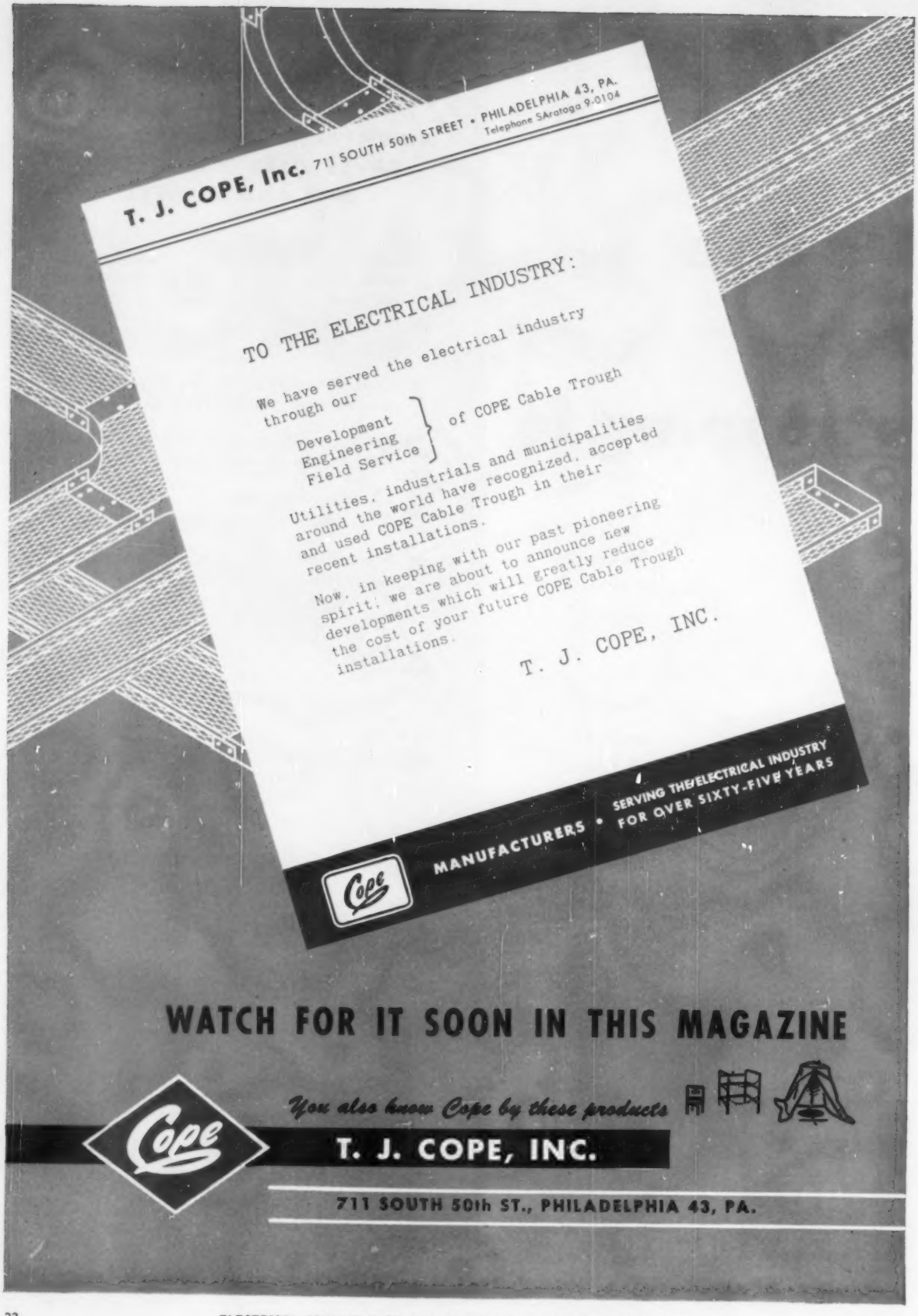
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CRESCENT

TYPE UF

UNDERGROUND FEEDER and BRANCH CIRCUIT CABLE

Also listed by Underwriters' Laboratories as

TYPE NMC – NON-METALLIC SHEATHED CABLE

Type UF Underground Feeder and Branch Circuit Cable is a new type first adopted in the 1953 National Electrical Code. It is recognized in single conductor construction, sizes #14 to #4 A.W.G. inclusive and in two-conductor and three-conductor flat construction, sizes 14, 12 and 10 A.W.G. CRESCENT SYNTHOL TW thermoplastic compounds are used in insulation and jackets of these cables.

Multiple Conductor Type UF Cables are also listed as Non-Metallic Sheathed Cable, Type NMC, and may be used for both exposed and concealed work in dry, moist, damp or corrosive locations and in masonry block walls.

Licensed under Patent No. 2,663,775

Type UF single and multi-conductor cable is designed to be used underground, including direct burial, on feeders or branch circuits, when provided with overcurrent protection not in excess of the rated capacity of the individual conductors.

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CRESCENT WIRE & CABLE

OVER 70 YEARS EXPERIENCE

CRESCENT INSULATED WIRE & CABLE CO.

TRENTON, N. J.

COMPARE

LEV-O-LOCK devices on these 3 points...

1 QUALITY

LEV-O-LOCK devices are unexcelled. Leviton makes sure every part is made and quality-controlled within the plant. Most rigid tests and standards have to be met! Listed by UL and CSA.

2 PERFORMANCE

Outperforms all others on basis of actual laboratory tests. Sturdy phenolic stands up even in roughest applications. Receptacles feature double wiping contacts, made of heavy, wear-resistant phosphor bronze. Wiring is faster, simpler — extra large binding screws make it so! It's easy to change over to LEV-O-LOCK devices. They're interchangeable with other standard locking-types.

3 PRICE

Leviton buys huge quantities of the best in raw materials — then mass produces every component part of every product to precise Leviton standards . . . whether it's small screws or metal plates. The result? LEV-O-LOCK is a **truly precise, superior** product — at a trim price that defies competition!

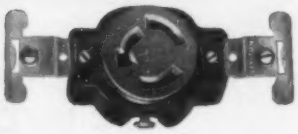
Why pay more when the best costs less?

your best jobs are done with... **LEVITON**

Send for literature:

LEVITON MANUFACTURING COMPANY • BROOKLYN 22, N. Y.
Chicago, Los Angeles • Leviton (Canada) Limited, Montreal
For your wire needs, contact our subsidiary
AMERICAN INSULATED WIRE CORPORATION

PUSH—TURN—AND IT'S LEV-O-LOCKED



Receptacle

Receptacle on Plate

Cap

Cord Connector

Available in 2, 3 and 4 wire Caps, Connectors and receptacles in 10 and 20 AMP. ratings.

NEW! A FEATURE-PACKED LINE OF TYPE D SAFETY SWITCHES

FOR REAL ECONOMY and special advantages to you and the user, there is nothing like this new Federal Noark® line of Type D (Nema Type G) Safety Switches. The line includes 30, 60, 100, 200, 400, and 600 amp. sizes and each is available in both general purpose and raintight enclosures.

The styling of these new Type D's is smart and modern... the general design is uniform throughout, assuring identical high standards of quality and performance plus attractive appearance of completed installations. In addition, each of these switches embodies those features that have proved most desirable and practical during years of service in the field.

EASE OF INSTALLATION is provided by generous wiring gutters... solderless connectors... neutrals located for direct feed-through wiring... plenty of right-size knockouts.

NEW STANDARDS OF RELIABILITY are assured by big, husky, current-carrying parts... simple knife blade construction... new patented pressure-type fuse holder.

MAINTENANCE IS SIMPLE because all moving parts are readily visible... unit block construction on 60, 100 and 200 amp. switches simplifies maintenance ... 30 amp. switch blocks molded of new high- shock phenolic material... operating bar under the block of 30 amp. switch permits unobstructed access to fuses.

Order the new Federal Noark Type D Safety Switches from your distributor for new savings and efficiency. And write us for full information.

FEDERAL PACIFIC ELECTRIC CO.

FORMERLY—FEDERAL ELECTRIC PRODUCTS COMPANY AND PACIFIC ELECTRIC MANUFACTURING CORP.

Main Office: 50 PARIS STREET, NEWARK 1, N. J.

Federal Pacific products: Stab-lok Circuit Breakers, Motor Controls, Safety Switches, Service Equipment, Industrial Circuit Breakers, Panelboards, Switchboards, Control Centers, Bus Duct, High voltage circuit breakers and power switches ★ Sales offices in principal cities.

Leading Manufacturers of Fluorescent Tubes say:

CERTIFIED CBM CERTIFIED by ETL BALLASTS

are Tailored to the Tube

No one knows better the value of CERTIFIED CBM BALLASTS than the manufacturers of fluorescent tubes. For the satisfactory performance of their lamps is vitally dependent on the ballasts that operate them. Here's what they say:

CHAMPION *says:*
"Fluorescent lamps are designed to operate at specific electrical values. The use of auxiliary equipment that has been proven to meet these agreed upon standards will assure the user maximum value for his lighting dollar with a minimum of operational failures. Certified Ballasts are inexpensive insurance."

GENERAL ELECTRIC *says:*
"The life and light output ratings of fluorescent lamps are based on their use with ballasts providing proper operating characteristics. Ballasts that do not provide proper electrical values may substantially reduce either lamp life or light output, or both. Ballasts certified as built to the specifications adopted by the Certified Ballast Manufacturers (CBM) do provide values that meet or exceed minimum requirements. This certification assures the lamp user, without individual testing, that lamps will operate at values close to their ratings."

SYLVANIA *says:*
"The light and life ratings of fluorescent lamps are based on three hour burning cycles under specified conditions and with ballasts meeting American Standards Association specifications. Ballasts marked with the CBM emblem and certified by Electrical Testing Laboratories, Inc., meet ASA specifications."

WESTINGHOUSE *says:*
"Use ballasts that are tested and Certified by Electrical Testing Laboratories or ones that are otherwise known to meet the specifications of the lamp manufacturer. These will give best results with Westinghouse fluorescent lamps."

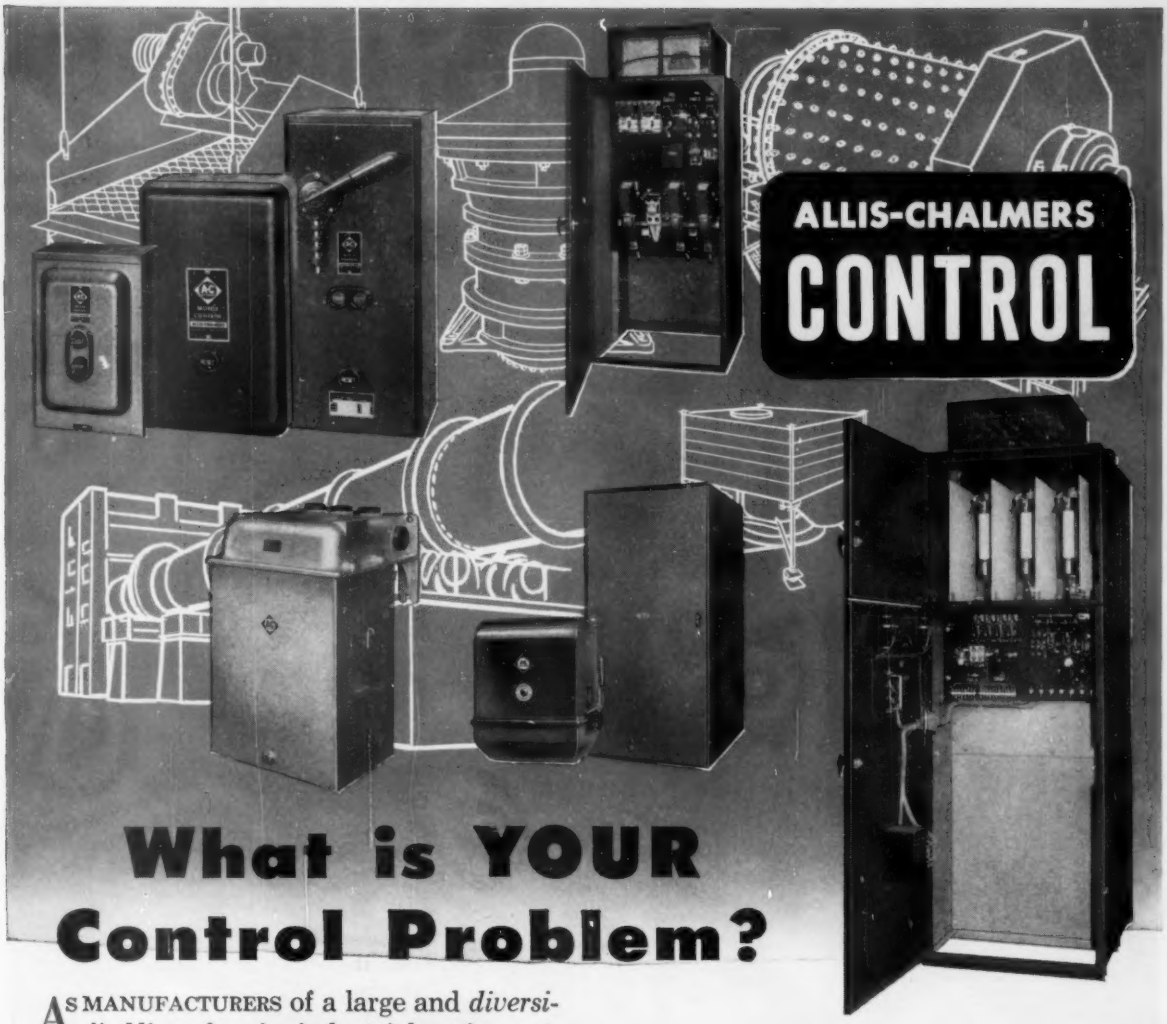
By using fluorescent fixtures that are equipped with CERTIFIED CBM BALLASTS you are assured long lamp life, full light output and trouble-free operation.

That's why CERTIFIED CBM BALLASTS merit the slogan—Tailored to the Tube.

CERTIFIED BALLAST MANUFACTURERS

Makers of Certified Ballasts for Fluorescent Lighting

2116 KEITH BLDG., CLEVELAND 15, OHIO



What is YOUR Control Problem?

AS MANUFACTURERS of a large and *diversified* line of major industrial equipment, Allis-Chalmers has been called upon to solve thousands of control application problems in practically every industry. This specialized experience in coordinating power utilization is *yours* when you specify Allis-Chalmers control.

Control for every ac application

Allis-Chalmers offers an extensive line of manual and magnetic control to meet every condition of motor operation. Control functions, varying with specific job requirements, include full or reduced voltage starting, acceleration, speed control, reversing or non-reversing, and dynamic braking.

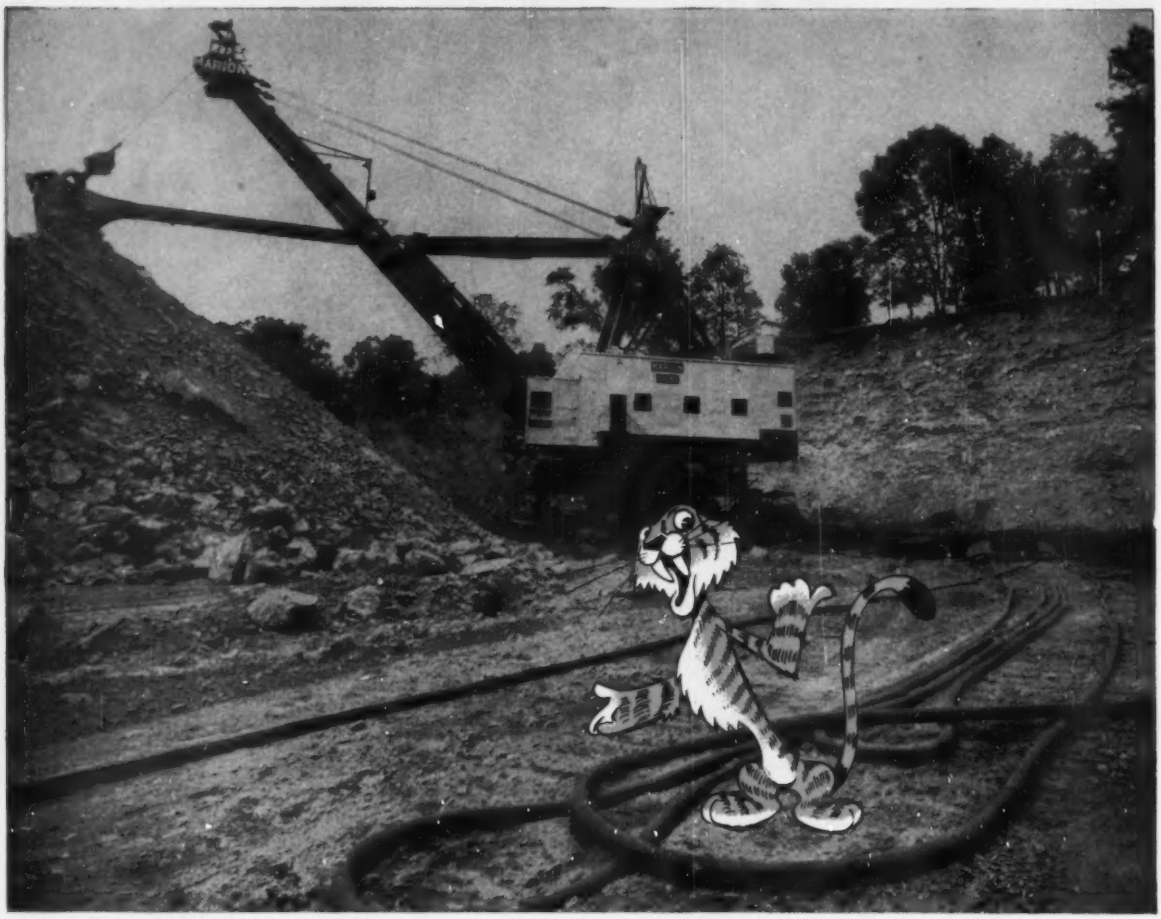
Custom protection

Built into all Allis-Chalmers control is the type and degree of protection dictated by the application. Controls are available in general purpose and special cabinet, including water-tight, dust-tight and explosion-proof enclosures. A-4516

For complete information on any specific control problem, call your nearby Allis-Chalmers representative or write Allis-Chalmers, Milwaukee 1, Wis.

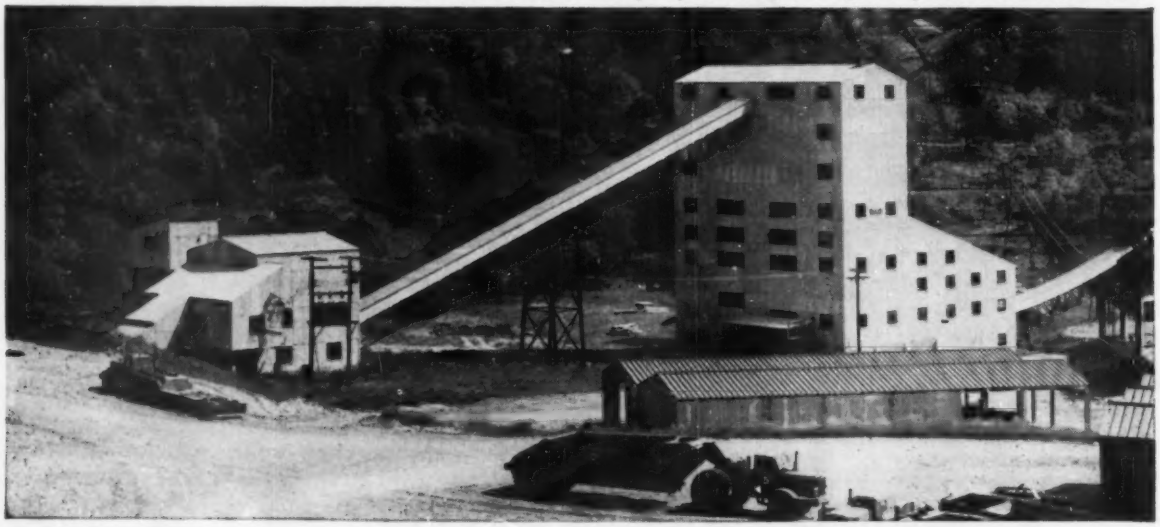
ALLIS-CHALMERS

They needed a top quality cable



THE 18-CUBIC-YARD SHOVEL moves a lot of overburden in a hurry. It is supplied with 7500 feet of 3-conductor 1/0 Tiger Brand Amerclad.

HERE IS THE MINE HEADQUARTERS. Wash tower is at center. Notice conveyor system at right that goes to power station over the hill.



like *Tiger Brand* for this high production strip mine

HERE IS A PORTRAIT of the 45-cubic-yard shovel that has removed most of the overburden at this mine.

IF you take a ride out near Zanesville, Ohio, someday, you'll spot the new Muskingum Mine—probably the most modern strip mine in the world. It supplies coal for the new 400,000 kw Muskingum River Plant of The Ohio Power Company, part of the American Gas and Electric System.

The big 18 and 45-cubic-yard electric power shovels operate day and night through sun, rain or snow. And when you consider the eye-popping cost of lost production time, it's easy to see why these shovels need the most dependable power cable on the market. At this mine, it's 100% Tiger Brand Amerclad.

The cable is always exposed to foul weather and accidental abuse. It often stretches for more than a *mile* from switchgear to shovel take-up reel. Yet, after more than 2 years on the job, the Tiger Brand Amerclad is in perfect condition without sign of wear.

If you need a cable that can *take it* . . . if you want cable for a power shovel, dredge, mine locomotive, welding machine or a heavy-duty electrical hand tool—you'll get more for your money if you specify Tiger Brand Amerclad. Drag it through puddles, over sharp rock; spill gasoline or oil on it and expose it to sun and ozone. Tiger Brand will still give you service you never thought possible. *Send the coupon.*

AMERICAN STEEL & WIRE DIVISION, UNITED STATES STEEL CORPORATION, GENERAL OFFICES: CLEVELAND, OHIO
COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO, PACIFIC COAST DISTRIBUTORS • TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA., SOUTHERN DISTRIBUTORS
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

A STANDARD TIGER BRAND CABLE FOR EVERY SPECIAL JOB!

paper & varnished cambric cable	shovel & dredge cable
asbestos wire and cable	mold cured portable cord
aerial, underground & submarine cable	machine tool & building wire special purpose wire & cable

SEND THE COUPON

American Steel & Wire Division
Room EC-124, Rockefeller Building
Cleveland 13, Ohio

☐ Please give me more information about Amerclad.
☐ I'd like to talk to your representative.

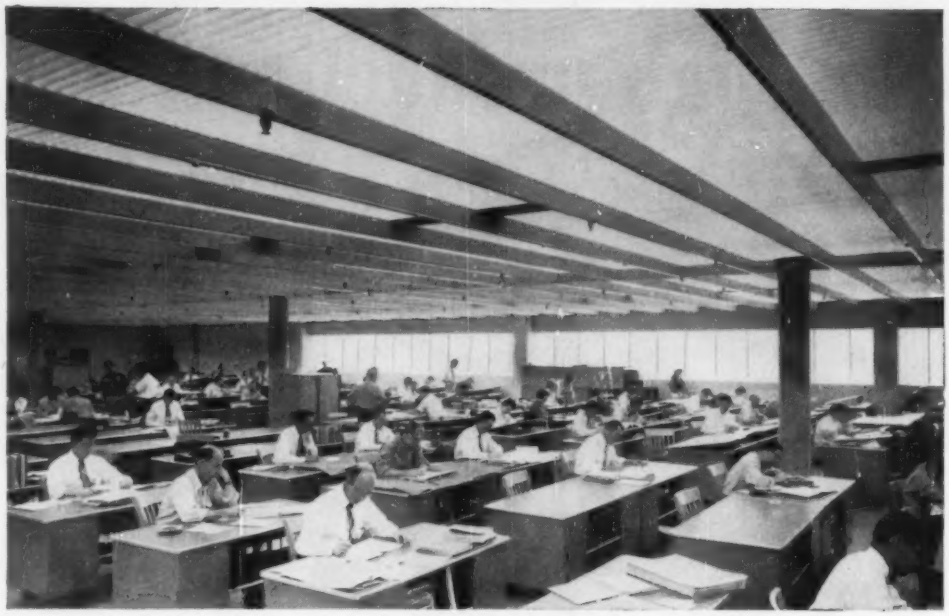
Name .....
Firm .....
Address .....
City ..... State .....

USS Tiger Brand **ELECTRICAL WIRE & CABLE**

USS

UNITED STATES STEEL

Douglas Aircraft Installs 2 Acres of Multi-Function Wakefield Ceiling in its New Design Center



Aircraft Design Building
El Segundo Division of Douglas Aircraft

Architects and Engineers: Kistner, Wright and Wright Los Angeles

Electrical Contractor: Hoffman and Jacobs Long Beach, Calif.

Licensed Agent: Graybar Electric Company, Inc. Long Beach, Calif.

Unprecedented Electric Ceiling supplied by Wakefield incorporates seven basic services and was installed in its entirety by an electrical contractor.

Here the Wakefield Ceiling realizes its ultimate multi-purpose potential. And here the electrical contractor comes to full stature as a factor in building construction. The complete job of installing over two acres of luminous corrugated Plexiglas panels, with which are integrated acoustical baffles, air diffusers, sprinkler heads, intercommunication loud speakers, power outlets and provisions for carrying telephone cables to point of use—this tremendous job was entrusted in its entirety to an electrical contractor.

Electric Ceiling provides these basic services

Fully diffused lighting of 90-100 footcandles

Acoustical equipment for noise control

Power distribution for electrical office equipment

Telephone services

Public address system

Air distribution and return

The sprinkler system

In addition the electrical contractor installed the electrical channel housings and assemblies, all designed and built by Wakefield, which support the plastic diffusers and 4000 lamps.

Wakefield is proud to have been chosen to work with the forward-looking management of Douglas Aircraft and their architects and engineers in the planning and building of the world's most advanced aircraft engineering center. Proud, too, to see an electrical contractor play such an important role in the construction of this superb building.

Wakefield has recently prepared new brochures on the Wakefield Ceiling and Wakefield Geometrics which will help the electrical contractor, as well as the building owner, to realize the tremendous advantages of multi-purpose ceilings. Write The F. W. Wakefield Brass Company, Vermilion, Ohio. In Canada: Wakefield Lighting Limited, London, Ontario.

Wakefield **Over-ALL Lighting**

That's the difference—so get Cutler-Hammer Unit Breakers... Modern, Low Cost Circuit Protection

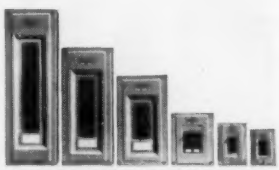
• The Cutler-Hammer Unit Breaker *is* everything and *has* everything you want in high quality, low cost, modern circuit protection. It provides convenience in stocking and it provides convenience in selecting the proper capacities for any home or any building. And in addition it affords complete, uniform, fast protection on all wire capacities within each Unit Breaker size range. No slow operation here and over-fast operation there, but uniform safe protection throughout. Get Cutler-Hammer Circuit Protection and you *provably* get the best.

CUTLER-HAMMER, Inc., 1306 St. Paul Ave., Milwaukee 1, Wisconsin

CUTLER-HAMMER
UNIT BREAKER
C-H

Basically 3 Components

The C-H Unit Breaker consists of case, individual circuit breakers, and cover. Easy to assemble, and install.



6 Cases—32 Circuits

Only 6 case sizes handle all needs to 32 circuits. Also raintight and special types available.

Rock Bottom Prices Plus These Features

Ambient compensated. No pre-tripping in hot climates. Thermal magnetic protection against heavy overloads and shorts. Compact, rugged, lasting, dependable. Quick make and break for long contact life. Famous C-H Quality.

Cut Plant Power Costs

...increase machine efficiency

Want to save installation and operating costs? You can do both with an Allis-Chalmers dry-type transformer.

ALLIS-CHALMERS Dry-Type Transformers

10-kva dry-type transformer.

225-kva dry-type transformer.

Low Installation Cost. Allis-Chalmers dry-type transformers require no expensive vaults. They are safe and clean. They fit into industrial plant layouts — they are lightweight and easy to handle.

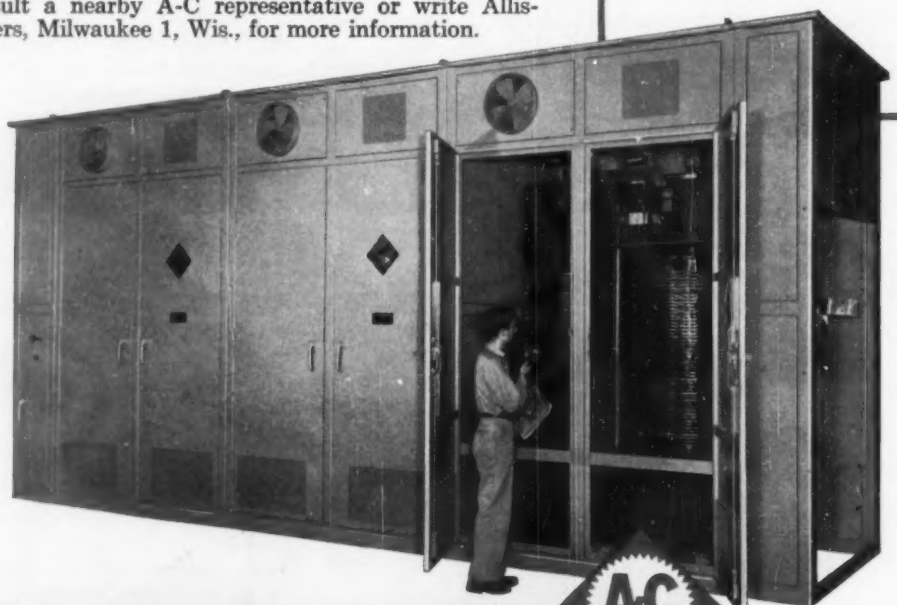
Low Operating Cost. Routine inspection is all the maintenance you need. There are no gauges to check, no liquids to filter.

Completely Enclosed Design is standard construction on small low voltage transformers. They are recommended for indoor or outdoor applications and operate well in dusty or lint filled atmosphere. Solderless connectors speed installation. Mount on wall or post. Ratings are single-phase sizes 10 kva and smaller; three-phase sizes 15 kva and smaller, 600 volts and below.

Open Ventilated Transformers are designed for indoor use. They are easy to hook up; need no special vault enclosures. They are cooled by natural or forced draft. Used as load center transformer or unit substation in the larger sizes, with high or low voltage switchgear. Ratings are single-phase sizes 15 kva and larger; three-phase sizes 30 kva and larger, 15 kv and below.

Consult a nearby A-C representative or write Allis-Chalmers, Milwaukee 1, Wis., for more information.

A-4267



This 10,000-kva dry-type transformer is one of a large number of units Allis-Chalmers is building for the Atomic Energy Commission.

ALLIS-CHALMERS

A-C ALLIS-CHALMERS

Capital Spending Plans for 1955 . . .

Here is Good News About Business Prospects

In 1955, American industry is now planning to spend within 5 per cent of the amount it is spending this year on new plant and equipment. This is the tensely awaited result of a check-up just completed by the McGraw-Hill Department of Economics.

Hundreds of companies, by far the largest number in the eight-year history of these McGraw-Hill surveys, cooperated in the check-up. Combined, they represent 29 per cent of all industrial employment and over 60 per cent of employment in the industries where capital investment is highest. Such a broad cross section constitutes a reliable gauge of the plans of industry as a whole.

PLANS FOR CAPITAL INVESTMENT

	MILLIONS OF DOLLARS			Percent Change
	1953 ACTUAL*	1954 ESTIMATED*	1955 PLANNED	1954-1955
All Manufacturing	$10,026	$ 9,249	$ 8,598	—7%
Petroleum Industry†	4,600	4,875	4,920	+1
Mining	506	380	311	—18
Railroads	1,312	851	769	—10
Other Transportation and Communications	2,954	2,922	2,640	—10
Electric and Gas Utilities	4,548	4,274	4,206	—2
ALL INDUSTRY	23,271	21,784	20,727	—5

*United States Department of Commerce; Chase National Bank; McGraw-Hill Department of Economics

†Petroleum refining, included under both "All Manufacturing" and "Petroleum Industry," is included only once in the total

What is the meaning of these plans, detailed by the table below, for capital investment next year? Is it good or bad news, so far as it concerns the prospect of continuing prosperity? It is to this crucial question that this editorial is addressed.

Key to Prosperity

It is not only good but very important business news that American industry plans to spend in 1955 almost as much for new plant and equipment as it is spending this year. The reason it is important is that a high level of activity in the capital goods industries is universally recognized as a particularly potent ingredient of prosperity for the nation as a whole. A dollar spent for capital goods is spent again and again for wages and materials. Its stimulating effects, called by economists multiplying effects, move through the economy in much the same way that a pebble tossed into a pond creates a widening circle of ripples. This is one reason why there is such intense business interest in the surveys of plans for capital investment.

Here are the principal reasons why the results of the McGraw-Hill survey are a good omen for continuing prosperity:

1. American industry is demonstrating that it does not need the stimulus of war-created shortages, or a rearmament boom, in order to maintain a very high level of capital investment.

The slight decrease now planned for 1955 will still maintain a level only about 11 percent below the all-time peak attained in 1953 under the stimulus of a defense expansion boom.

2. Capital investment promises not merely to stabilize at a high level, but actually to increase as 1955 goes on and thus give renewed stimulus to business.

The level of investment now planned for 1955 by *industry* — manufacturing, petroleum, mining, transportation, communications and utilities — is within 5 per cent of 1954. Contract awards for *commercial* construction — stores, office buildings, warehouses and other service establishments — as compiled by the McGraw-Hill publication ENGINEERING NEWS-RECORD, indicate a substantial increase in 1955. Thus total capital expenditures by *all business* may be very close to this year's total.

Actually, in the fourth quarter of 1954, business capital expenditures, as reported to the U. S. Department of Commerce, are down about 2.5 per cent from the average for the year as a whole. So there is a good chance that during 1955 the annual rate of capital investment will rise above this present level.

Effect of Tax Changes

The plans reported by the McGraw-Hill survey are preliminary plans, reported at the beginning of the period of business budgeting for 1955. As budgets are completed, new projects may bring the total expenditure that is planned even closer to this year's figure and thus make an even greater contribution to continuing prosperity.

But it also cannot be too strongly emphasized that these are plans; they are not accomplished investments. As such they have the vulnerability to changed conditions that characterize any plans.

There is some indication in the results of the McGraw-Hill check-up that one change in conditions recently made by the United States government has had an important stimulating effect on plans for business investment next year. It is a liberalization of the allowances for depreciation. Apparently encouraged by this provision, most of the smaller companies are planning to maintain or increase their purchases of new equipment next year, whereas during the past three years their expenditures have been declining. This is obviously a development that strengthens our economy.

A government insensitive to the key importance of capital investment by business, both in providing prosperity and in raising our standard of living, might easily destroy the present plans. One of the easiest and surest means to do this is excessive taxation of business profits which are the key ingredient of business investment. Whether the extraordinarily constructive program recently enacted by the federal government in the field of business taxation can be sustained remains to be seen. **If it can be sustained, the remarkably cheering plans of business for capital investment in 1955 can readily become firm foundations for a continuing prosperity.**

This message is one of a series prepared by the McGraw-Hill Department of Economics to help increase public knowledge and understanding of important nationwide developments that are of particular concern to the business and professional community served by our industrial and technical publications.

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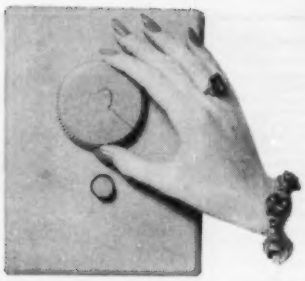
Donald C. McGraw

PRESIDENT

McGRAW-HILL PUBLISHING COMPANY, INC.



NEW

LUXTROL

LIGHT CONTROL

easy to install as an ordinary wall switch!

Mark another turning point in the history of home lighting!

On-off, all-or-nothing lighting is on the way out. New LUXTROL Light Control is here—producing at the touch of a dial **any level of light from dark to full-bright!**

And make a note of this: new LUXTROL Light Control will give you no installation problems whatsoever. It's as easy to install as an ordinary wall switch! All you do is . . .

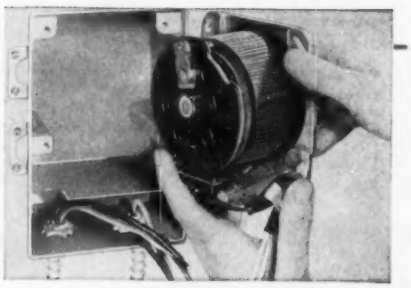
1) Lay out your wiring according to specification.

2) Attach the box to either studding or horizontal supports (it comes with mounting ears on all four sides.)

3) After the plasterer has been around, place the control in the box, wire, and put on the faceplate.

Note too that LUXTROL is built by a leading producer of commercial lighting control systems. So you can forget about service and maintenance.

You'll soon be getting calls for this entirely new kind of home light control. So make a date *now* for a personal demonstration. Call Western Union Operator 25 in your own city and ask for the name of your LUXTROL distributor.

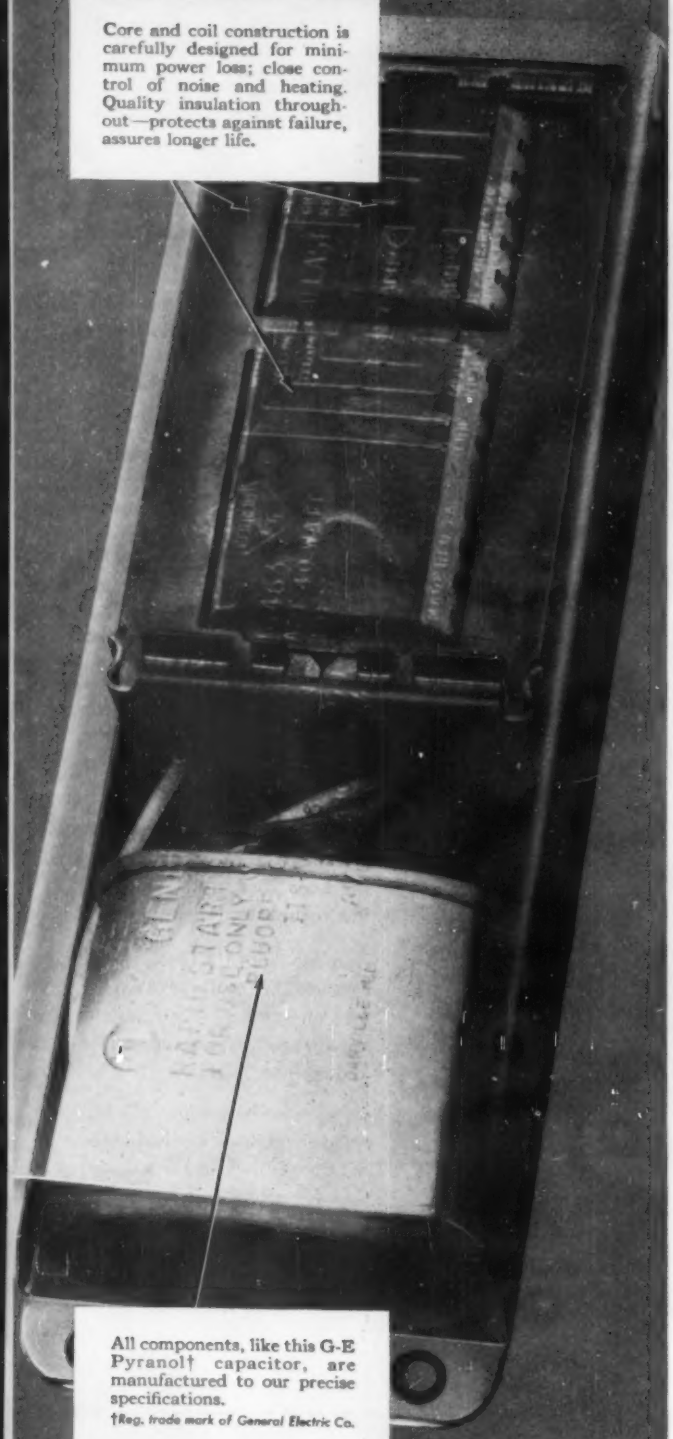


For full technical data on LUXTROL Light Control, write your name and address on a corner of this page, tear off and mail to The Superior Electric Company, 6124 Demers Avenue, Bristol, Connecticut.

Flora shows you*

General Electric

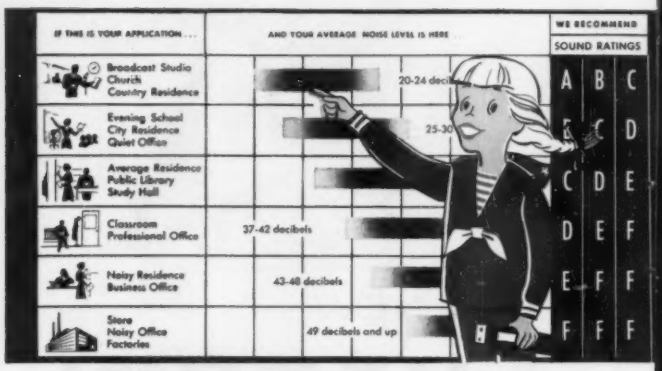
Core and coil construction is carefully designed for minimum power loss; close control of noise and heating. Quality insulation throughout—protects against failure, assures longer life.



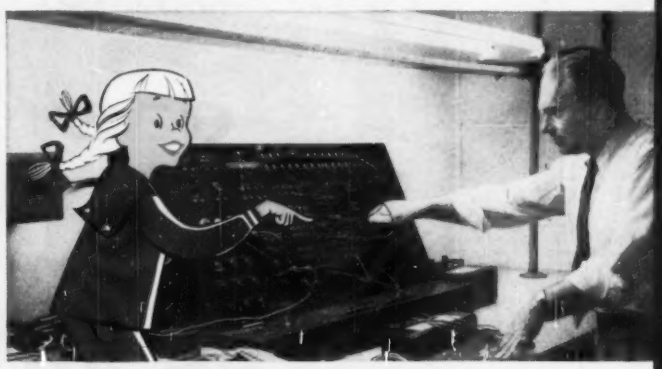
All components, like this G-E Pyranol† capacitor, are manufactured to our precise specifications.

†Reg. trade mark of General Electric Co.

Every part of a G-E ballast is carefully designed, manufactured, tested and assembled to give you the best ballast value.



1. SOUND RATING—Only G-E ballasts are sound-rated to assure you of meeting your sound level requirements. You can choose the proper G-E ballast whether it's for a quiet installation or for an application where noise is less important. G-E sound rating eliminates expensive noise complaints.



4. LAMP-MATCHED DESIGN—The ballast governs light output and life of the fluorescent lamp. G-E ballasts are lamp-matched to provide up to 50% longer lamp life and up to 30% more light output. Here you save two ways—lower lamp replacement costs and more light from your installation.

Whether you use, install, specify or make fluorescent fixtures, G-E ballasts mean savings to you!

The six reasons why you save, described by Flora above, grow out of these simple facts:

- **G-E ballasts are designed to high engineering standards (1, 3, 4, 5 above).**
- **G-E ballasts are made under exacting quality control standards (2 above).**
- **G-E ballasts are backed by complete sales and engineering services (6 above).**

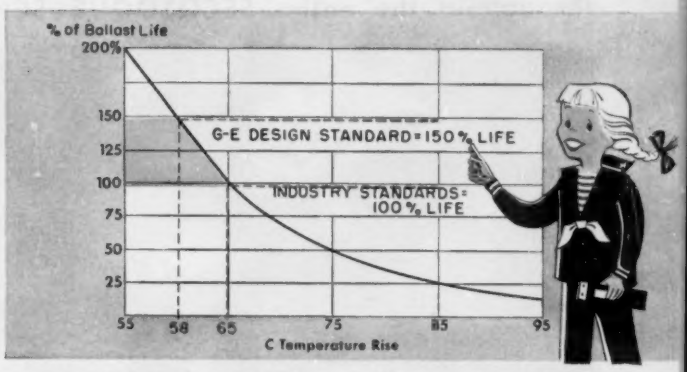
Only G.E. offers you all these money saving features.

In every conceivable way, we make sure you get more when you use G-E ballasts. For example, G-E engineering standards

Copyright 1954, General Electric Company.

six ways . . .

ballasts help you save lighting dollars



2. UNIFORMLY HIGH QUALITY—Lighting specifiers have learned to depend upon the consistently high quality of G-E ballasts. Rigid material specifications and constant production line tests mean uniformly good ballasts; save lighting dollars on early replacement and maintenance costs.

3. LONGER LIFE—G-E ballasts are designed to operate 10% cooler than U.L. and Certified Ballast Manufacturers' standards. Tests show that a 10% reduction in ballast temperature rise can mean up to 50% longer ballast life, giving you half again as much ballast life!

5. PROVED PRODUCT LEADERSHIP—General Electric has the largest group of specially trained ballast design and development engineers in the industry. They're constantly improving G-E ballasts, assuring you of all benefits of top quality when you "specify" General Electric.

6. COMPLETE CUSTOMER SERVICES—General Electric's extensive sales, warehousing, and engineering organization is anxious to serve you. These unequalled facilities can provide services for you which no other ballast manufacturer offers. These extra services mean real saving to you.

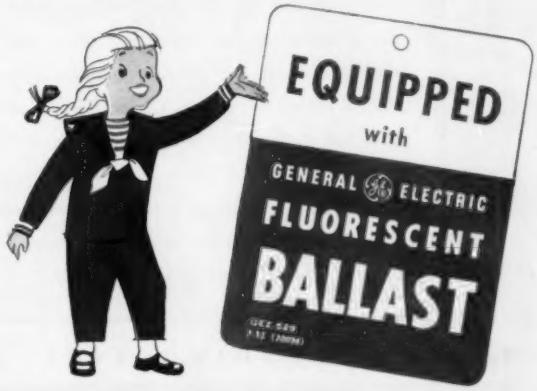
actually exceed the specifications established by the Certified Ballast Manufacturers where extra quality pays off to you. Another example: Ten quality control stations make dozens of physical and electrical checks during manufacture to assure that each ballast measures up to the high G-E standards.

Next time, specify General Electric Ballasts. Dollar for dollar they're your best ballast value.

LOOK FOR THIS G-E BALLAST TAG ➔

A G-E ballast tag on your fixture is proof that it's equipped with a top-quality ballast. It's the easy way to be certain. For further information on G-E ballasts, contact your nearest G-E Apparatus Sales Office or G-E Distributor. General Electric Company, Schenectady 5, New York. 401-7

***Miss Flora Ballast, G-E Ballast Mascot.**

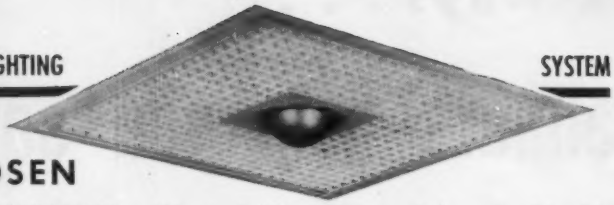


Progress Is Our Most Important Product

GENERAL ELECTRIC

Skylike

THE INCANDESCENT LIGHTING SYSTEM



ARCHITECT-CHOSEN

throughout the entire SECOTOQUE SCHOOL, West Islip, Long Island, N. Y.

MR. JAMES VAN ALST, architect of the Secotoque School says...

"The present trend toward lower ceiling heights in school construction makes it necessary to use recessed lighting equipment rather than the conventional pendant luminaires. Not all recessed equipment is satisfactory under these conditions because of high brightness, excessive contrast with adjacent ceiling areas and limited distribution. The Skylike system, because of its indirect nature, offers more even distribution and lower brightness than many other types of recessed equipment and was therefore selected for all classrooms, the auditorium and cafeteria. The fixture is of pleasing modern design and its initial cost is low. More important, however, is the fact that Skylike units require a minimum of cleaning maintenance and may be relamped from the floor by use of a pole-type lamp changer."

The SKYLIKE Lighting System is being selected by leading schools throughout the nation. Architects favor it for its adaptability to modern design and for its effective method of solving all the problems inherent in school lighting. Contractors favor it for its easy installation with a minimum of labor. School officials like its comparative low initial cost and simple, inexpensive maintenance. Investigate SKYLIKE for any school lighting problem.

MODERN SCHOOL LIGHTING

A 12 page booklet describing Silvray and Skylike units that solve, in a practical way, all school lighting problems. Free upon request...address Dept. 1254

THERE'S NOTHING LIKE SKYLIKE FOR SCHOOL LIGHTING

SKYLIKE LIGHTING, INC. A SILVRAY ASSOCIATED COMPANY
BOUND BROOK, NEW JERSEY

ALL THE FEATURES *plus*....

MATCHED ENCLOSURES!

SQUARE D's **NEW** POWER-STYLE

SWITCH BOARDS

DESIGN LEADERSHIP FEATURES

Distinctive Styling provides an attractive, modern appearance matching the control center design.

Easier Installation because removable front and back plates expose generous wiring parts. Isolated horizontal wiring trough has drop-off openings, assuring safer, neater wiring.

Flexibility. Complete sections or branch units can be added or changed to meet specific job requirements.

Easier Inspection and Maintenance. Front, side and back plates are removable, thus providing easy and immediate access to specific areas.

SEPARATELY.... OR AS A TEAM THEY DO THE JOB BETTER!

Write for Bulletin SD-18. Address Square D Company, 6060 Rivard Street, Detroit 11, Michigan.

SQUARE D's **NEW** PLUG-IN

CONTROL CENTERS

DESIGN LEADERSHIP FEATURES

Increased Safety because bus bars are fully enclosed, rigidly supported and have ample cross section...circuits isolated by individually enclosed plug-in units...disconnect handle designed for maximum operator protection.

Flexibility. Individual plug-in units or complete sections can easily be added, removed or exchanged. Push-buttons, pilot lights, and selector switches can readily be added to unit doors.

Installation Economy. All wiring channels are large and accessible from front without removing units...no "wire fishing."

Space economy, too. Up to six combination starters fit in a 20"x20"x 90" section. Plug-in unit heights are designed in space-saving increments of 3 inches.

Write for Bulletin 244. Address Square D Company, 4041 N. Richards St., Milwaukee 12, Wisconsin.

SQUARE D COMPANY

ASK YOUR ELECTRICAL DISTRIBUTOR FOR SQUARE D PRODUCTS

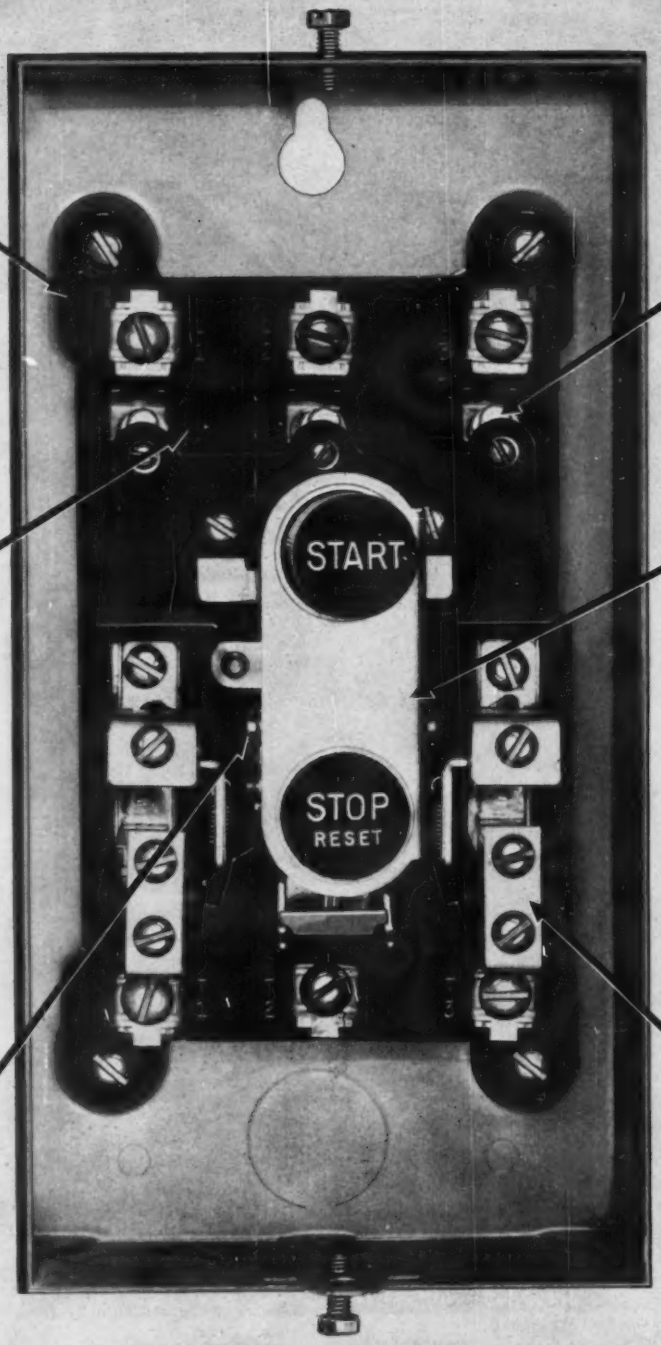
6 Reasons Why . . .

G-E MANUAL STARTERS GIVE MAXIMUM

INSULATED BASE. The starter's molded insulated base provides maximum protection from grounding. Barriers to isolate contacts and reduce arcing are made from hot molded material which doesn't absorb moisture. They have sufficient protection against arc-overs, and also act as mounting supports for the switch.

ARC PROTECTION. Arcs are completely confined, even with maximum horsepower and stalled rotor current, in deep insulated wells. This feature provides a high safety factor by reducing the possibility of arc-over between adjacent contacts and results in increased contact life.

SAFE FROM VIBRATION. The snap-action switch mechanism is built so it cannot accidentally trip from machine vibration. Both push button and lever types help protect against inadvertent operation. Guard on toggle-type switch cover prevents accidental tripping, yet is large enough for operation by a gloved finger. The handle guard provides a means for padlocking switch in either ON or OFF position. For fractional horsepower motor switches, a new handle guard incorporating these safety features is available.



SPLIT-SECOND BREAK. Operating mechanism is spring-loaded for split-second breaks which reduce possible arcing and contact freezing. Made of fine silver, contacts give years of make and break operations. Large contact surface assures positive contact on make.

TRIP-FREE MECHANISM. On G-E manual starters, the operating mechanism trips free on overload, opening the contacts. This action makes it impossible for the switch to be held closed under injurious overload conditions. Visual indication is given by the lever or push button in the neutral position.

NO INJURIOUS OVERLOADS. Bi-metallic overload relays allow your motor to deliver maximum power without premature tripping, yet help protect against overloads and stalled rotor conditions. This positive protection helps prevent damage to the motor due to heating. Bi-metallic overload relays, unlike the solder-pot type, can be mounted in any position. Easily installed heaters are available in all ratings.

PROTECTION

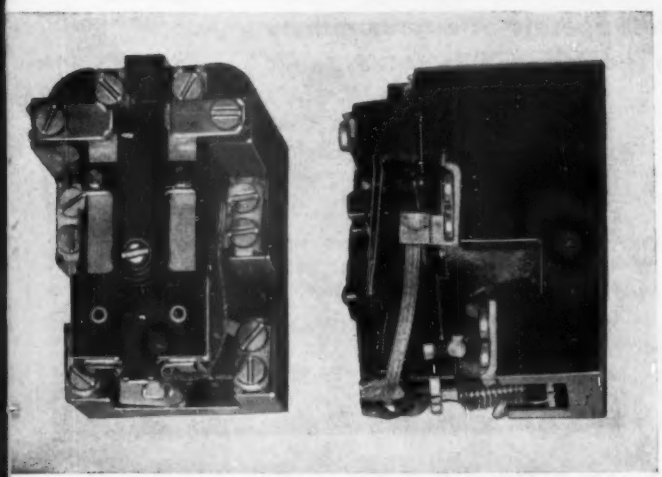
Maximum protection, inside and out, is provided by G-E manual starters. In addition to the features illustrated at left, protective devices have been built into the enclosure itself. Provision has been made for padlocking starter cover (toggle types may also be padlocked in ON or OFF position) to help protect personnel.

ADDITIONAL FEATURES of G-E manual starters include front-connected, clamp-type terminals; straight-thru wiring; general purpose, water-tight, dust-tight and explosion-proof enclosures; clearly marked line and load terminals; and operating mechanisms that are replaceable as units.

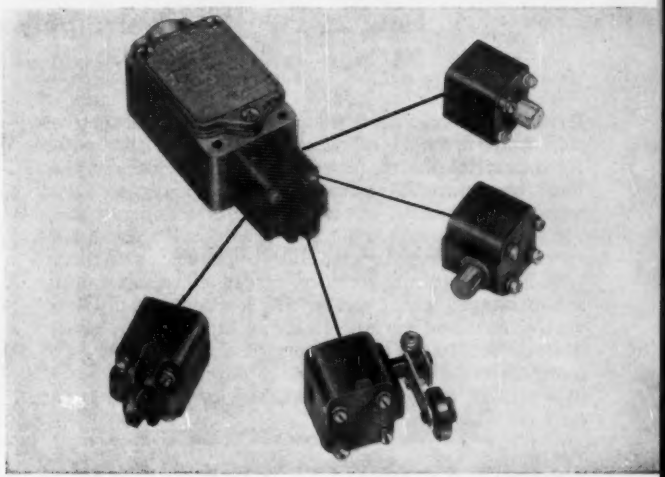
FOR MORE INFORMATION contact your nearest G-E Sales Office, or Distributor, or write Section 730-54, General Electric Company, Schenectady 5, N. Y. Ask for Bulletin GEA-1522.

EASILY ACCESSIBLE MOUNTING KNOCKOUTS in top, sides, bottom and back of case simplify installation. Knockouts are punched for ½ or ¾ inch conduits. Straight-thru wiring, adequate wiring space and saddle-type clamping terminals make wiring easy.

DEPENDABLE RELAYS, LIMIT SWITCHES FOR VARIED APPLICATIONS



Small size, general-purpose relays are high current rated. Both a-c and d-c forms are available in ratings up to 300 volts. The new, strong, long-life shunt assures dependable relay performance.

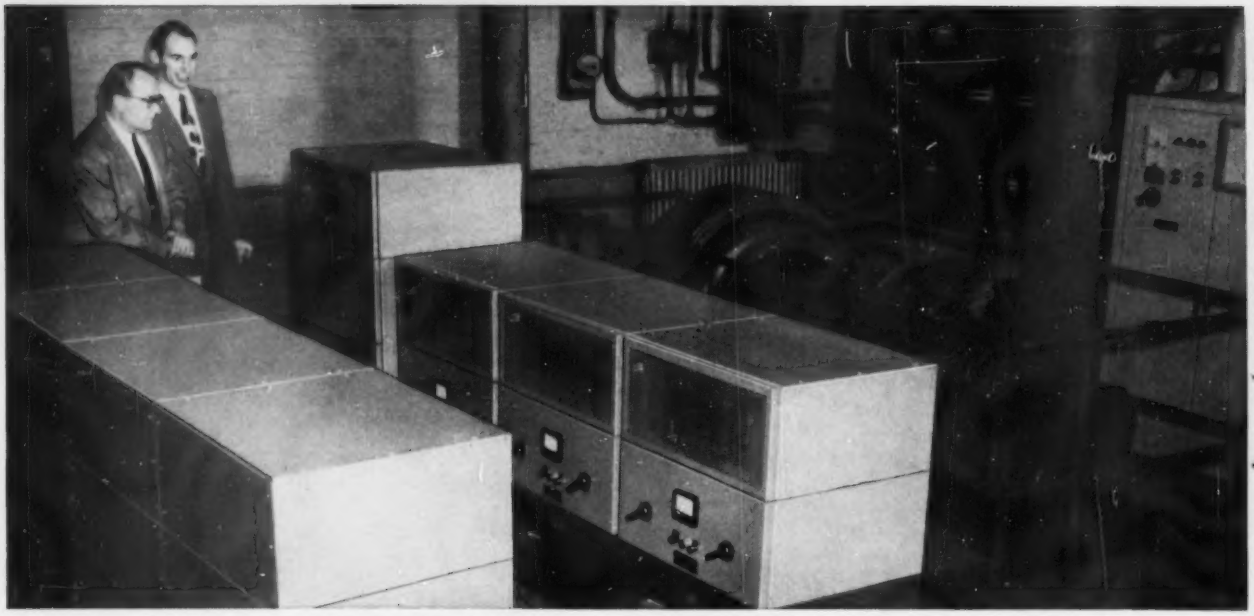


Compact, track-type limit switch has four interchangeable heads: roller lever, side pushrod, top pushrod, and roller pushrod. Heads mount in any of four 90-degree operating positions.

CHOOSE FROM THE COMPLETE GENERAL-PURPOSE CONTROL LINE

MANUAL STARTERS — MAGNETIC STARTERS — PUSH BUTTONS — COMBINATION STARTERS — RELAYS — REDUCED VOLTAGE STARTERS — SOLENOIDS — LIMIT SWITCHES

GENERAL ELECTRIC



SUPPLYING D-C POWER for an oxygen-hydrogen plant is this installation of General Electric germanium rectifier power conversion units. These individual units are rated 25 kw, and are combined in series-parallel totalling 150-kw output.

General Electric Announces Germanium

New 25-kw d-c power supply units operate at approximately 94 per cent efficiency between half and full rated load.

General Electric germanium rectifier power conversion units are an important new source of d-c power for industrial plants. In a number of applications they have important advantages over other types of conversion equipment, either rotating or static.

WHAT ARE THESE UNITS?

G-E germanium rectifier power conversion units are packaged equipments which economically convert alternating current to direct current near where it is to be used. They consist of a transformer, germanium rectifiers, and control equipment mounted in a sturdy metal casing. A small cooling fan is the only moving part.

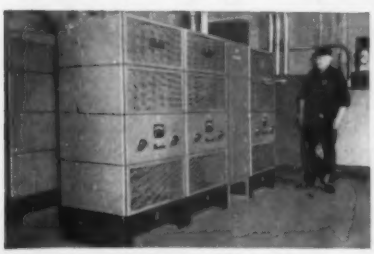
WHERE ARE THEY USED?

Typical applications for germanium rectifier power conversion units are supplying power for constant speed d-c motors, or excitation current for synchronous motors. They can be used to supply direct current for magnetic chucks, brakes, and clutches, or for testing d-c equipment. They are also especially suited to electrochemical processes.

WHAT ARE THEIR ADVANTAGES?

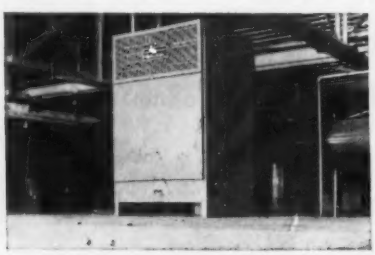
The 94 per cent efficiency of these germanium power conversion units is their outstanding advantage. As the chart shows, they operate with this exceptional efficiency even at half load. No other type of recti-

Additional General Electric Rectifier Products to Meet Other D-C Power Requirements



SELENIUM RECTIFIER POWER SUPPLIES

Ratings 0.75 to 25 kw fit most d-c needs. With dynamic braking panel including absorbing resistor, units can be used with hoists or other regenerative loads.

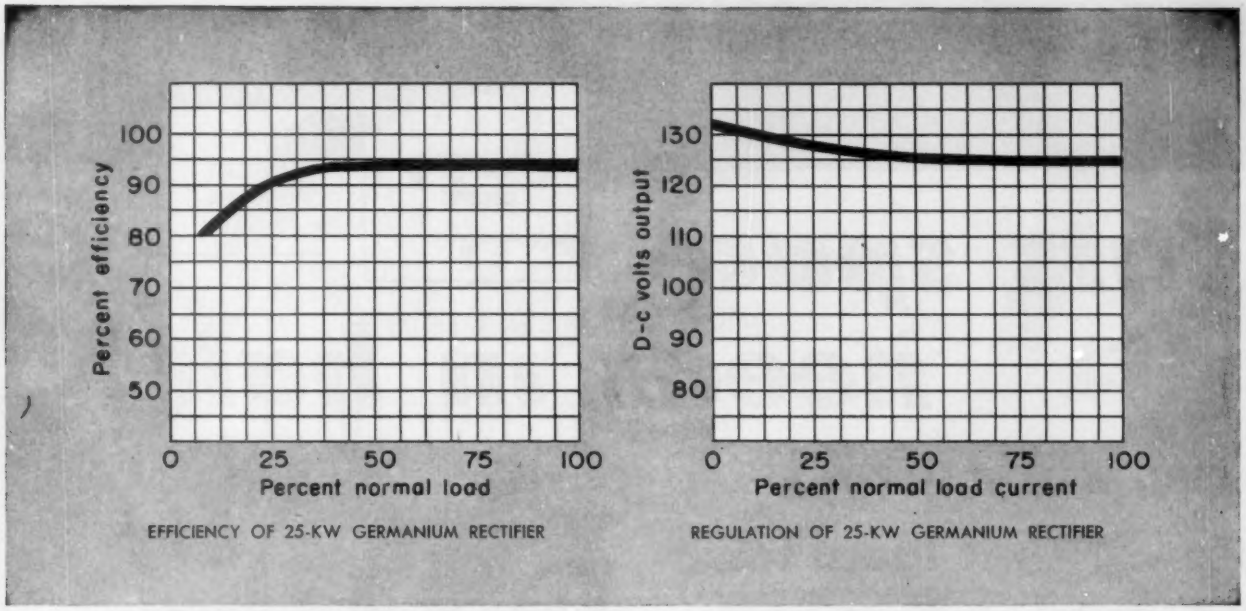


ELECTROPLATING POWER SUPPLIES

General Electric's line of plating power supplies included models for laboratories and barrel plating as well as equipment with manual or automatic regulation.

INDUSTRIAL TRUCK BATTERY CHARGERS

Reliable, easy-to-operate metallic rectifier battery chargers are available for all makes and models of electric driver-lead or driver-ride industrial trucks.



CONVERSION EFFICIENCY of new 25-kw germanium conversion units runs at about 94 per cent from half to full rated load.

VOLTAGE REGULATION of equipment is excellent. Output voltage drops only about 6 per cent between no load and full load.

Rectifier Power Conversion Equipment

fication equipment of comparable efficiency has this characteristic at this voltage and power level.

The excellent regulation of these units is shown on the chart, also. Output voltage drops only about six per cent between no load and full load. The minimum power factor of these units is 95 per cent.

Installation costs are low since no special foundations or mounting platforms are required. Units can be placed on any flat surface and after simple electrical connections have been made, they are ready to operate.

Maintenance costs are practically zero because nothing moves except the cooling fan. Germanium rectifiers do not deteriorate with use.

RATINGS

Standard germanium rectifier power conversion units are presently rated 65/125 volts, 400/200 amperes d-c. However, units may be combined in series and/or parallel where higher ratings are required.

For complete information on this newest source of d-c power for industry, contact your nearest G-E Apparatus Sales Office, or fill in the coupon for bulletin GEA-5825, Germanium Rectifier Power Conversion Units. *General Electric Co., Schenectady 5, N. Y.*

GENERAL ELECTRIC

*Registered trade-mark of General Electric Co.

GENERAL-PURPOSE BATTERY CHARGERS

For charging stand-by, control, signal and engine-starting batteries, General Electric makes a complete line of Tungar* and selenium general-purpose chargers.

Section F462-9, General Electric Company
Schenectady 5, N. Y.

Please send me the following bulletins:

☐ for reference ☐ planning an immediate project

- ☐ GEA-5825 Germanium Rectifier Power Conversion Units
- ☐ GEA-5658 Selenium Rectifier Power Conversion Units
- ☐ GEC-970 Electroplating Power Supplies
- ☐ GEA-5292 Automatic Chargers for Driver-ride Trucks
- ☐ GEC-826 General-purpose Battery Chargers

Name .....

Company .....

Street .....

City ..... **State** .....

VAULT BEFORE

VAULT AFTER

Cuts space needs in half!

New Vault-Type Power Unit Ideal for Shopping Centers

ALLIS-CHALMERS NEW vault-type power unit provides three or four standard distribution transformer core and coil assemblies plus metering transformers in a single, submersible-type tank. The units are so compact that a complete vault-type power unit takes only half the space of a bank of three single-phase distribution transformers.

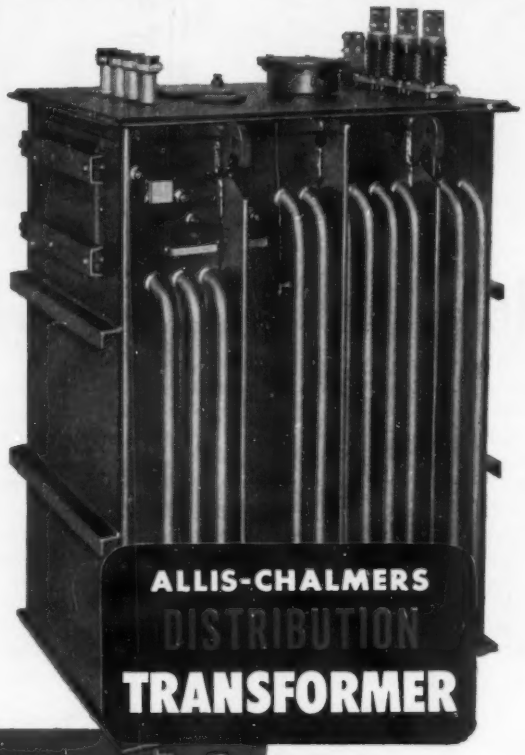
The new unit can be designed to supply three-phase power or three-phase power and single-phase lighting loads. It is the ideal answer to the space problem in areas like schools, hospitals, large apartment houses or where increased use of air conditioning or other large appliances is causing loads to grow fast.

Simplified Installation

Allis-Chalmers vault-type power units can be installed either underground or in buildings. Core and coil assemblies are internally connected at the factory and leads are terminated at the cover. This reduces installation time and expense by eliminating primary and secondary bus work.

Get complete information on the space-saving advantages of Allis-Chalmers new vault-type power units. Consult the A-C office nearest you or write Allis-Chalmers, Milwaukee 1, Wisconsin.

A-4426



TEMPORARY CLAMPS seal HV access panel until installation. After final system connections are made, panel is welded into position. All other covers are weld-sealed. Special paint and compound protect case. Space is provided for an additional core and coil assembly to change a three-phase unit into a combination single-/three-phase unit.

A-C ALLIS-CHALMERS

ALLIS-CHALMERS

IT'S NEW!
IT'S BLUE!

... the plastic tape for bundling

SPANGLEAM

Now . . . all SPANGLEAM EMT in sizes ranging from ½" to 2" is shipped to you neatly bundled in the new blue plastic tape! It's another SPANG first—and *everybody* benefits from this new packaging!

BETTER FOR ELECTRICAL CONTRACTORS—because the plastic tape keeps the SPANGLEAM EMT bundle tight until you're ready to break open the package . . . makes EMT easier to transport and handle on the job . . . prevents slippage of individual lengths.

BETTER FOR SPANG DISTRIBUTORS—because the new plastic tape makes SPANGLEAM EMT easier to store, easier to identify in warehouse stock, easier to inventory . . . presents a clean, neat appearance . . . no rope marks mar the SPANGLEAM finish.

AND IT'S BETTER FOR SPANG, TOO—because the new plastic tape eliminates hand bundling . . . saves production time . . . speeds up deliveries.

Look for the new blue plastic tape bundle on SPANGLEAM EMT. It marks a *top-quality* product . . . the same *top quality* you find in all SPANG tubular products. Your SPANG Distributor has a complete line of all SPANG Conduit and fittings.

SPANG® CONDUIT

SPANG-CHALFANT
Division of The National Supply Company
GENERAL SALES OFFICE:
TWO GATEWAY CENTER, PITTSBURGH, PA.
District Offices and Sales Representatives in Principal Cities

How to win a bid *without sacrificing profit*

Next time a customer says, "Tough luck but we gave the job to your competitor," remember—there is more than one way to be competitive without cutting your profit.

New Rome FlexAll may be the answer.

FlexAll fits more jobs. You don't have to lug around wires for different applications because FlexAll is a multiple purpose nonmetallic sheathed product. On-the-job time and costs are cut. Cash tied up in inventory is less. FlexAll solves a lot of other problems, too. For example:

Single-Conductor FlexAll

1 It has Underwriters' Laboratory approval as Type UF (Underground Feeder).

2 It is recognized by the National Electrical Code (1953) for installation in branch or feeder circuits *buried directly in the earth,* when provided with overcurrent protection.

3 The integrally applied Rome Synthinol, Type TW, thermoplastic insulation and sheath are resistant to wet and corrosive conditions.

4 It's manufactured in sizes 14 AWG through 4 AWG standard color, black—packaged in 500-ft. coils—600 volts.

Two- and Three-Conductor FlexAll

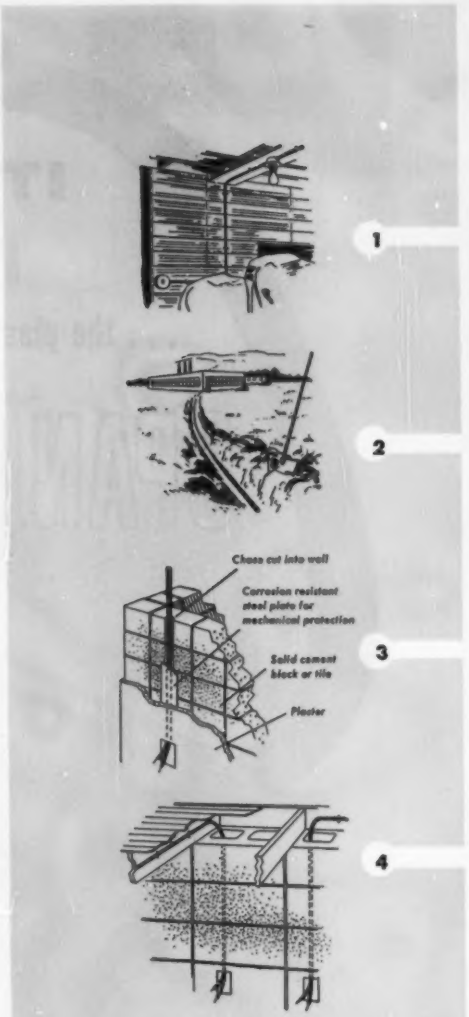
1 It has UL approval as both Type UF and Type NMC (Nonmetallic Sheathed Cable—Corrosive Resistant).

2 It has National Electrical Code (1953) recognition for:
- 1 branch or feeder circuits *buried direct in earth,* with proper overcurrent protection.
- 2 *interior wiring,* either exposed or concealed, in corrosive, wet or dry locations.
- 3 installation within hollow spaces of *outside or inside* masonry *block or tile walls.*
- 4 embedding in plaster or shallow chase in masonry, when suitably protected.

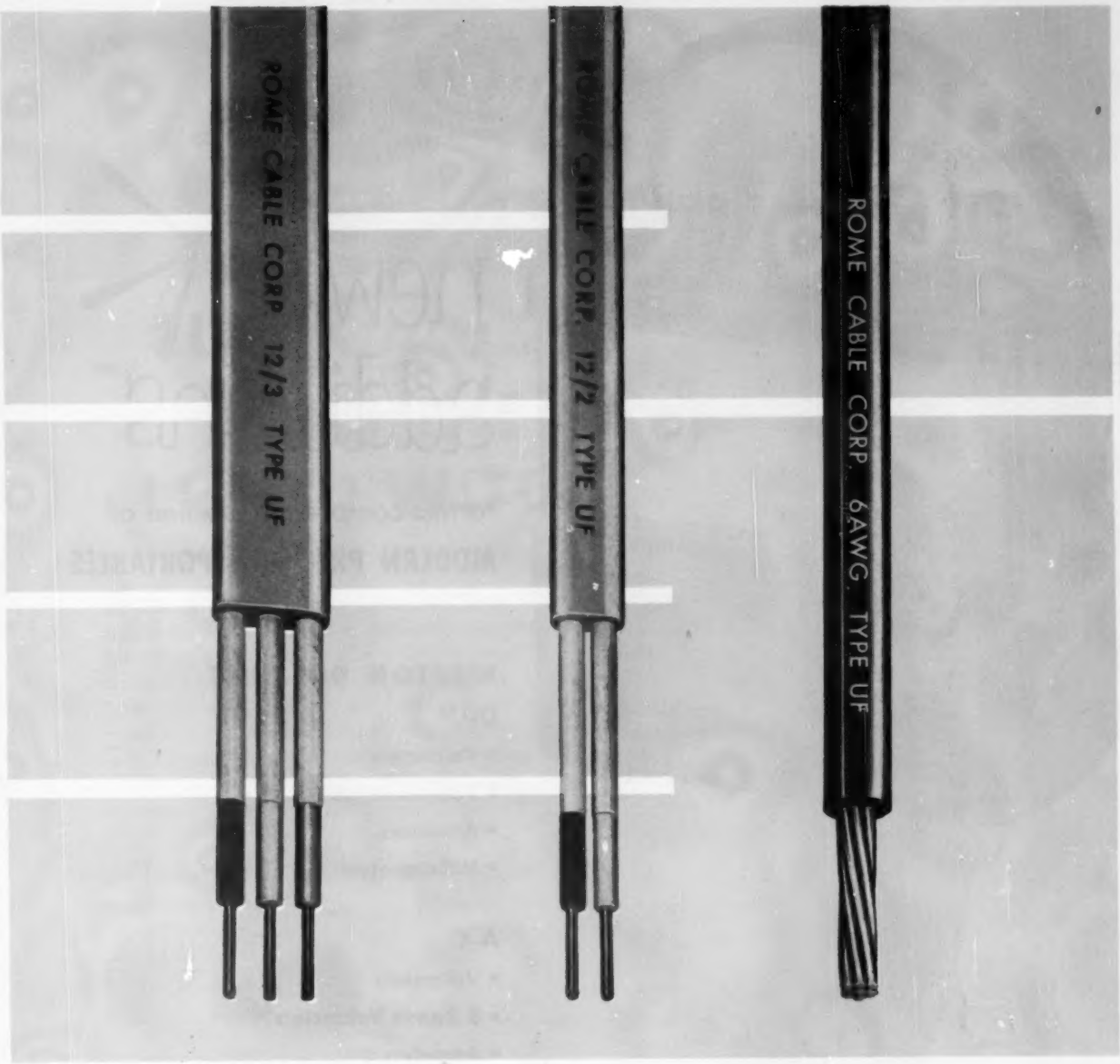
3 The high-quality insulation is Rome Synthinol. Individual conductors are covered with an inorganic glass yarn wrap. Over the assembled conductors there's a Rome Synthinol sheath. Rome Synthinol is flame, rot, abrasion and moisture resistant for safe installation under wet or corrosive conditions.

4 It is manufactured in sizes 14 AWG through 10 AWG—standard color, pearl gray—in cartons of 250 ft.—600 volts.

Add all these features together—and you are in a better position to land the next job . . . without sacrifice to profit.



Rome Triple Knit Weatherproof Wire is packaged 500 ft. to the carton for your convenience in storing and use on the job.



Another **Rome** *first...*

New Glass Covered Triple Knit Weatherproof Wire

2 inside coverings of cotton and an OUTER COVER OF GLASS YARN

There are 4 big installation advantages in Rome's Fiberglas covered contractor's weatherproof...

1 *Resistance to Weathering*—Fiberglas has inherent resistance to weathering. Even if in time the asphalt saturant and finisher deteriorate, the glass outer cover holds the inner cotton layers intact and prevents unsightly festooning.

2 *Moisture Resistance*—Individually, glass fibers resist moisture absorption—glass yarns are solid rods or filaments, consequently, water cannot penetrate the inner structure of the yarn. Coated with asphaltic compound, glass yarn attains extremely high resistance to moisture.

3 *Tensile Strength*—Inorganic glass yarn has a tensile strength several times that of comparable organic fibers and retains it indefinitely.

4 *Chemical Resistance*—Glass fibers are not affected by oils and are resistant to most acids—they are an especially durable support for asphalt coatings.

The permanency of glass, YOURS now on Rome Triple Knit Weatherproof—sizes 14 AWG through 4 AWG—in special wholesaler's package of 500 feet.

It Costs Less to Buy the Best

ROME CABLE Corporation
ROME • NEW YORK
and
TORRANCE • CALIFORNIA

new additions

to this comprehensive line of

MODERN PRECISION PORTABLES

WESTON 901 LINE

D-C

- Voltmeters
- Volt-Ammeters
- Ammeters
- Milliammeters

A-C

- Voltmeters
- **8 Range Voltmeters** *
- Ammeters
- **7 Range Ammeters** *
- Milliammeters

A-C and D-C single-phase Wattmeters *

Providing unequaled scale visibility due to wrap-around windows, the same rated accuracy of 0.5% and the same efficient shielding of all other instruments in this famous line, these three new additions make the 901 group the most comprehensive line of precision portables available. Complete specifications and prices available in bulletin form, or from the WESTON representative in your vicinity . . . WESTON Electrical Instrument Corporation, 614 Frelinghuysen Avenue, Newark 5, New Jersey.

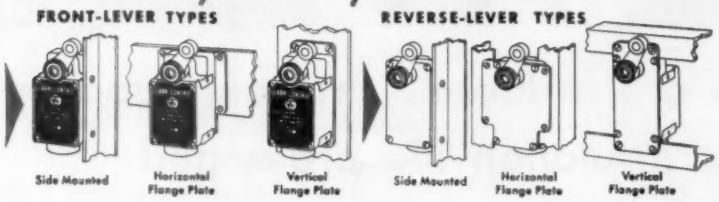
WESTON
Instruments

NEW!

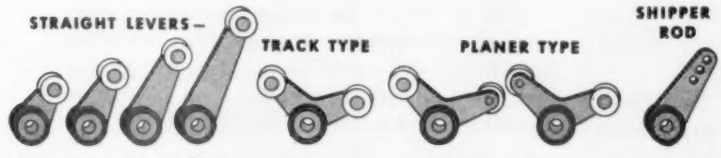
CLARK *Type DM* MACHINE LIMIT SWITCH

• This new heavy-duty limit switch is built with a minimum of moving parts, and with emphasis on simplicity of construction. The primary objective in its design is to provide dependable, accurate, trouble-free operation for a long life. All latch and trip-bearing surfaces are nylon to steel for minimum wear. All springs are in compression for greatest safety—they cannot be overloaded. This and other features make the switch as nearly fail-safe as possible.

Mounting Arrangements



Operating Levers



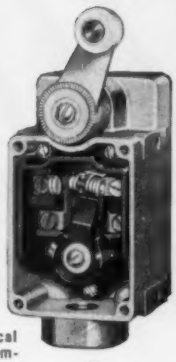
Nylon roller cushions impact, has low friction coefficient and long wearing qualities.

Reversible operating lever. Simple screw driver adjustment for reversing or positioning.

Heavy molded insulating chamber surrounds all live parts and provides ample wiring space for four No. 12 wires with Stakon connectors.

Areas subjected to arcing are protected by glass-melamine plates.

Electrical and mechanical sides of switch are completely isolated.



Nema Type 5 dust-tight, oil-tight enclosure of heavy die-cast construction.

Double-concentric overtravel springs in compression for fail-safe operation.

Return spring is in compression. Can be changed without tools to either side of arm, or removed for maintained contact.

Spring-loaded latches are nylon for low friction and long life.

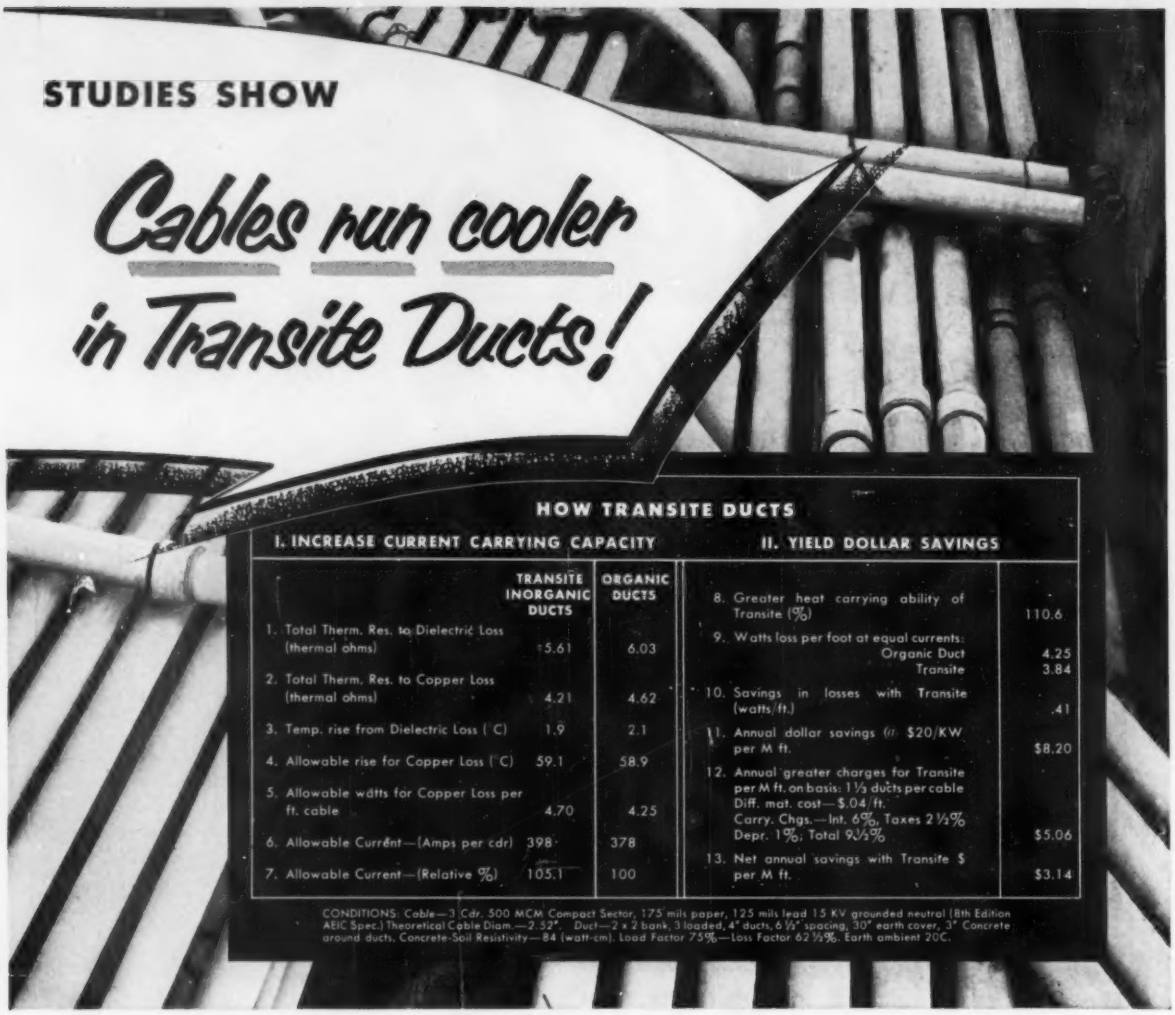
Choice of ½" or ¾" conduit opening.

Write for Bulletin 102DM

The **CLARK** **CONTROLLER** *Company*

Engineered Electrical Control

1146 East 152nd Street ▪ ▪ Cleveland 10, Ohio


STUDIES SHOW
Cables run cooler in Transite Ducts!
HOW TRANSITE DUCTS
I. INCREASE CURRENT CARRYING CAPACITY
II. YIELD DOLLAR SAVINGS
TRANSITE INORGANIC DUCTS
ORGANIC DUCTS
1. Total Therm. Res. to Dielectric Loss (thermal ohms) 5.61 6.03
2. Total Therm. Res. to Copper Loss (thermal ohms) 4.21 4.62
3. Temp. rise from Dielectric Loss (°C) 1.9 2.1
4. Allowable rise for Copper Loss (°C) 59.1 58.9
5. Allowable watts for Copper Loss per ft. cable 4.70 4.25
6. Allowable Current—(Amps per cdr) 398 378
7. Allowable Current—(Relative %) 105.1 100
8. Greater heat carrying ability of Transite (%) 110.6
9. Watts loss per foot at equal currents: Organic Duct 4.25 Transite 3.84
10. Savings in losses with Transite (watts/ft.) .41
11. Annual dollar savings @ $20/KW per M ft. $8.20
12. Annual greater charges for Transite per M ft. on basis: 1⅓ ducts per cable Diff. mat. cost—$.04/ft. Carry. Chgs.—Int. 6%, Taxes 2½% Depr. 1%, Total 9½% $5.06
13. Net annual savings with Transite $ per M ft. $3.14
CONDITIONS: Cable—3 Cdr. 500 MCM Compact Sector, 175 mils paper, 125 mils lead 15 KV grounded neutral (8th Edition AEIC Spec.) Theoretical Cable Diam.—2.52". Duct—2 x 2 bank, 3 loaded, 4" ducts, 6½" spacing, 30" earth cover, 3" Concrete around ducts. Concrete-Soil Resistivity—84 (watt-cm). Load Factor 75%—Loss Factor 62½%. Earth ambient 20C.

—and copper losses are reduced . . . current capacity is increased . . . insulation life prolonged

TESTS have been made for many years by the Johns-Manville Research Center, to determine how Transite Ducts improve the dissipation of heat by conductors under load. The application of the test results is summarized above.

The figures prove that Transite Ducts will carry heavier current loads than organic ducts when sheath temperatures are the same. The result is a cooler cable under a given load . . . lower I^2R losses . . . longer insulation life from lower operating temperatures.

Transite Ducts offer many other advantages, too. Made of asbestos-cement, they are incombustible, resistant to corrosion, unaffected by electrolysis. When arcing occurs, Transite protects adjacent cables from damage. These durable, light-weight ducts provide complete and permanent cable protection, together with savings on installation and maintenance.

For complete details on these tests and the many advantages of Transite Ducts, write for free copy of Brochure EL-29A. Address Johns-Manville, Box 60, New York 16, N. Y. In Canada, 199 Bay Street, Toronto 1, Ontario.

JOHNS-MANVILLE JM PRODUCTS

Johns-Manville TRANSITE DUCTS

TRANSITE KORDUCT—for installation in concrete

TRANSITE CONDUIT—for exposed work and installation underground without a concrete encasement

LOOK AT YOUR MAGNET WIRE SPECIFICATION!

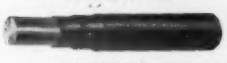
THERE'S A ROEBLING MAGNET WIRE TO MEET IT EXACTLY...ECONOMICALLY

THERE'S NO NEED TODAY for searching, shopping or experimenting... in Roebling's *complete* magnet wire line there's the right wire and insulation for your exact winding requirements and for completely dependable service performance.

Here are a few of the Roebling Magnet Wires currently being used successfully by all types of manufacturers the world over:

ROEVAR TYPE F

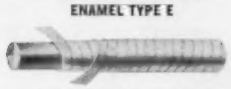
ROEVAR TYPE HF


ROEVAR TYPE TF

ROEVAR TYPE QF

ROEVAR COTTON TYPE FC

ENAMEL TYPE E


DOUBLE COTTON TYPE DC

DOUBLE ROEGLAS TYPE DG

ROEGLAS TYPE FG

SQUARE COTTON TYPE SQ.DC

SQUARE ROEGLAS SQ.DG

RECTANGULAR COTTON TYPE DC

RECTANGULAR ROEGLAS TYPE DG

Description	Type	Size Range A.W.G.	Temperature Rating
Single ROEVAR	Type F	8 – 40	Class A
Heavy ROEVAR	Type HF	8 – 40	Class A
Triple ROEVAR	Type TF	8 – 34	Class A
Quadruple ROEVAR	Type QF	8 – 30	Class A
ROEVAR and Cotton	Type FC, HFC, FDC, HFDC	8 – 32	Class A
ROEVAR and ROEGLAS	Type FG, HFG, FDG, HFDG	8 – 14	
Plain Enamel	Type E	14 – 44	Class A
Nylon Enamel	Type SN, HN, TN	14 – 34	Class A
ROEVAR-Nylon Enamel	Type FN, HFN, TFN	14 – 30	Class A
ROEBOND	Type 1, 2, 3	23 – 32	Class A
Cotton	Type C, DC	4/0 – 30	Untreated Class O Treated Class A
ROEGLAS	Type G, DG	4/0 – 14	Class B
ROEGLAS with Silicone Binder	Type G Silicone, DG Silicone	4/0 – 14	Class H
Square Double Cotton	Type SQ.DC	1/0 – 14	Untreated Class O Treated Class A
Rectangular Double Cotton	Type DC		Untreated Class O Treated Class A
Square ROEGLAS	Type SQ.G, SQ.DG	1/0 – 14	Class B
Rectangular ROEGLAS	Type G, DG		Class B
Square ROEGLAS with Silicone Binder	Type SQ.G Silicone, SQ.DG Silicone	1/0 – 14	Class H
Rectangular ROEGLAS with Silicone Binder	Type G Silicone, DG Silicone		Class H
ROETEMP (Mylar-Quinterra)	Round, Square, Rectangular	1/0 – 10	Class B
Paper	Various types and combinations		Untreated Class O Treated Class A
Paper-Cotton	Various types and combinations		Untreated Class O Treated Class A

Write for literature describing the complete Roebling Magnet Wire line. John A. Roebling's Sons Corporation, Trenton 2, N. J.

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For 2, 3, or 4 lamps — 4′ or 8′ long.

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Wide open on top and bottom
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Cool lamps last longer.
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Clean fixtures give more light!

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long-lasting beauty

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"Neither snow, nor rain, nor heat . . ."

Like the American Postman—Roller-Smith equipment for the Electrical Industry serves dependably under extreme conditions.

This new Duo-Roll Air Break Disconnect Switch typifies quality of the equipment manufactured by Roller-Smith for the Electrical Industry. Our Products incorporate all the very latest design improvements and offer all the advantages that modern production techniques and strict testing procedures provide. Shown operating under a 1½ inch ice load, this new switch includes the following features which assure the same trouble-free performance you can expect from all Roller-Smith equipment.

- HIGH PRESSURE, SELF-CLEANING SILVER CONTACTS.
- COMPLETELY VISIBLE HINGE AND CLIP CONTACTS.
- "SHUNT-LESS" HINGE CONTACT ALWAYS ENGAGED.
- BUILT TO WITHSTAND HIGH SHORT-CIRCUIT CURRENTS.
- RE-DESIGNED SWITCH BLADE ROTATES TO CRACK ICE LOAD, THEN RAISES TO OPEN CIRCUIT.
- SWITCH BLADE IS "LOCKED" WHEN IN CLOSED POSITION.
- SWITCH MAY BE MOUNTED IN ANY POSITION.
- ADJUSTABLE CLEVIS ASSURES POSITIVE CONTACT AT ALL MOVING PARTS.
- HINGE AND CLIP TERMINAL PADS ARE AT SAME ELEVATION.
- ROTATING INSULATOR BEARINGS ARE SELF-LUBRICATING.

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CORPORATION
ELECTRICAL SWITCHGEAR
BETHLEHEM, PENNSYLVANIA

Available thru Authorized Wholesalers.
Sales Representatives in all principal Cities.
CANADIAN FOREIGN

B-M *Fittings*

ARE APPROVED AS CONCRETETIGHT

When setting E. M. T. in concrete you can make each job easier and more profitable by using Briegel All Steel Indenter Fittings that have UL approval as CONCRETE-TIGHT. Contractors the world over recognize their cost cutting qualities and the fact that they make each wiring job a better job. It is only natural that Briegel Fittings are the most widely used E. M. T. connectors and couplings.

Cross Section Showing Indentations.

All B-M Indenter Fittings are U. L. approved as Concrete-tight and for General Use. (File Card E 10863). Also comply with Federal Specifications W-F-406.

BRIEGEL METHOD TOOL CO.

GALVA, • ILLINOIS

Warehouse Stocks in Principal Cities for Immediate Delivery!

gates lighted with "WET" wire

Fifty feet of water behind this head wall furnish almost two million gallons per minute to make 13,800 volts of hydroelectric power. Flow is controlled by two 20-ton penstock gates which are operated by a remote-control gantry crane.

Head wall lighting wire, providing current to illuminate this vital operation, has to withstand condensation in conduits without sacrificing size, weight, or flexibility. Simplex-ANHYDROPRENE Wire with Anhydrex insulation and a thin neoprene jacket was purchased because it was considered best qualified to meet these conditions.

Anhydrex water-resistant rubber insulation gives excellent moisture protection. Anhydrex eliminates lead sheaths. ANHYDROPRENE is more flexible because of its small size and light weight. A thin neoprene jacket provides protection against abrasion, flame, oil, sunlight, and mildew.

Whether it is used for plant wiring, remote control, underground primaries or just plain lighting, ANHYDROPRENE offers dependable service and long life. More detailed information is contained in Bulletin No. 115. Write to the address below for a copy.

Simplex-ANHYDROPRENE

. . . ANHYDREX INSULATED WATER-RESISTANT LIGHTING WIRE

SIMPLEX WIRE & CABLE CO., 79 Sidney Street, Cambridge 39, Mass.

Alcoa® Aluminum Bus Bar cuts costs; makes bus duct systems stronger, lighter

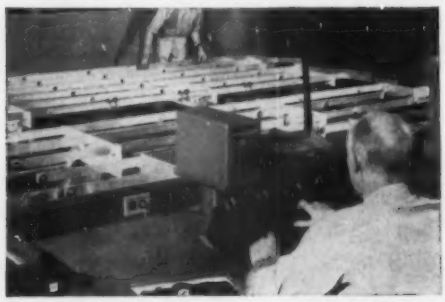
***PROPERTIES of No. 2 EC-T8**

Tensile Strength, psi	Yield Strength, psi
Minimum—29,000	Minimum—25,000

Conductivity—57 per cent IACS

Using Alcoa's new No. 2 EC* Aluminum Bus Bars, manufacturers of bus duct systems now can provide you with the most favorable combination of strength, light weight and conductivity at a significant saving in cost. Alcoa developed this new alloy to meet the demands of distribution bus and isolated phase construction for higher yield strength and better creep characteristics than could be obtained with EC metal. The result is yield strength of 25,000 psi for greater resistance to deformation by short-circuit current surges . . . a compressive creep rate substantially improved over EC No. 2 EC-T6 has a conductivity of 55 per cent IACS and No. 2 EC-T8 has a conductivity of 57 per cent IACS. In bus duct systems, the light weight of No. 2 EC—almost 50 per cent under that of copper for equal electrical conductivity—permits the use of simpler and less expensive supporting structures, besides permitting appreciable savings on installation or relocation. Equally important, manufacturers using this new Alcoa Bus Conductor can save you money on your initial investment. Ask your manufacturer for further information.

Tensile properties of Alcoa's No. 2 EC Alloy for bus bars are checked on this Baldwin-Southwark tension-testing machine, periodically calibrated to assure precision.



A precision potentiometer records the voltage drop on test sections of Alcoa Aluminum Bus Bar in the Massena, N. Y., laboratories, world's largest facility for aluminum conductor research.

Wherever your production requirements demand an efficient, flexible electrical distribution system, specify bus duct with Alcoa Aluminum Bus Bar. This dependable product is the result of 56 years of experience, beginning with the world's first aluminum bus bar installation. Write Alcoa to get the names of manufacturers offering bus duct with Alcoa Aluminum Bus Bar. ALUMINUM COMPANY OF AMERICA, 2108-M Alcoa Building, Pittsburgh 19, Pennsylvania.

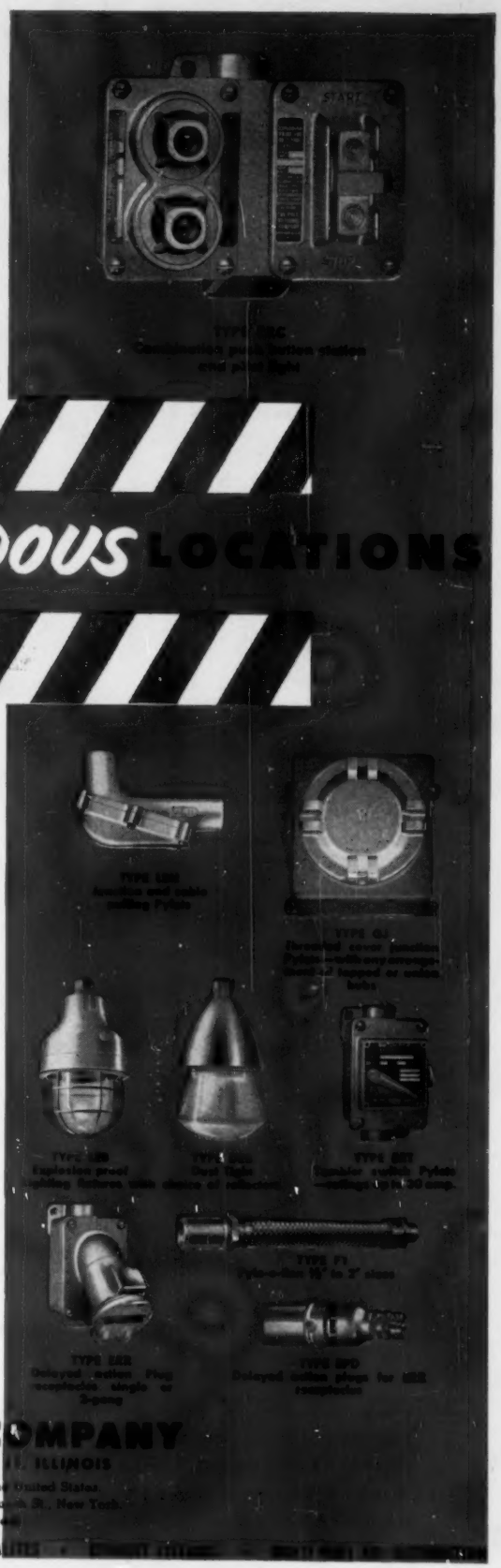
ALCOA ALUMINUM

ALUMINUM COMPANY OF AMERICA

EXPLOSION-PROOF and DUST-TIGHT

PYLETS®

FOR HAZARDOUS LOCATIONS



For added safety in hazardous locations specify from this rapidly expanding quality line of explosion-proof and dust-tight Pylets which the Pyle-National Company is constantly developing to meet the growing needs of industry.

All explosion-proof and dust-tight Pylets are designed in accordance with Underwriters' Laboratories requirements for electrical devices used in hazardous locations as defined in Article 500 of the National Electrical Code.

The substantial construction and high quality of materials and workmanship insures added safety, uninterrupted service and long life.

Consult your Pylet Catalog 1100 for complete listings of Explosion-Proof and Dust-Tight Pylets sold through electrical distributors.

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Lady of Lourdes Hospital, Camden, New Jersey

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MODERN ARCHITECTURE—
MODERN INTER-COM SYSTEMS

Modern buildings of all types are wired for inter-com sound systems. Efficiency demands "Talk—Don't Walk."

The beautiful new Lady of Lourdes Hospital at Camden, New Jersey, has taken advantage of the permanence and trouble-free performance of Belden Inter-Com Cables for its built-in systems. Specifically, Belden No. 8743 is used for its under-pillow radio receivers.

There is a specialized Belden Cable for every inter-com or sound system requirement.

Belden Manufacturing Co., 4623-A W. Van Buren St., Chicago 44, Ill.

"Talk-Don't Walk"

For *Permanent* Installations

For Profitable Work

FOR EVERY TYPE OF INSTALLATION
FOR EVERY TYPE OF EQUIPMENT
BELDEN HAS THE CABLE BUILT TO
MANUFACTURERS' SPECIFICATIONS

Belden
Inter-com
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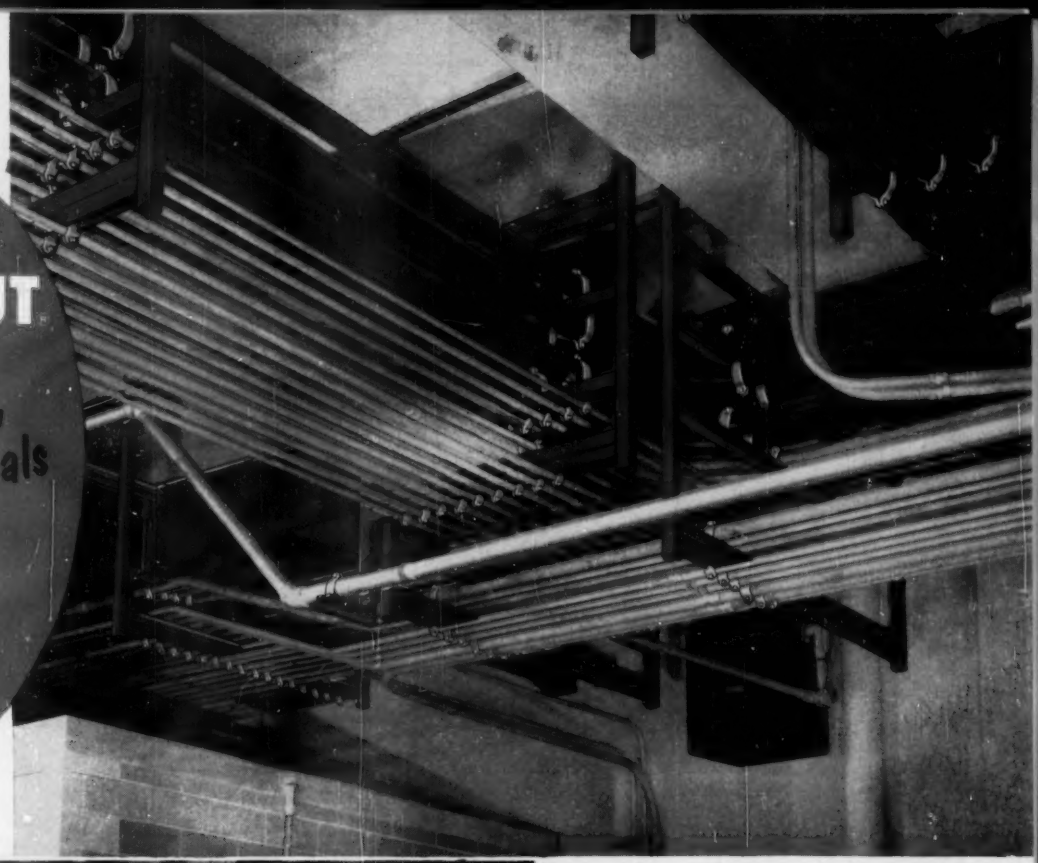
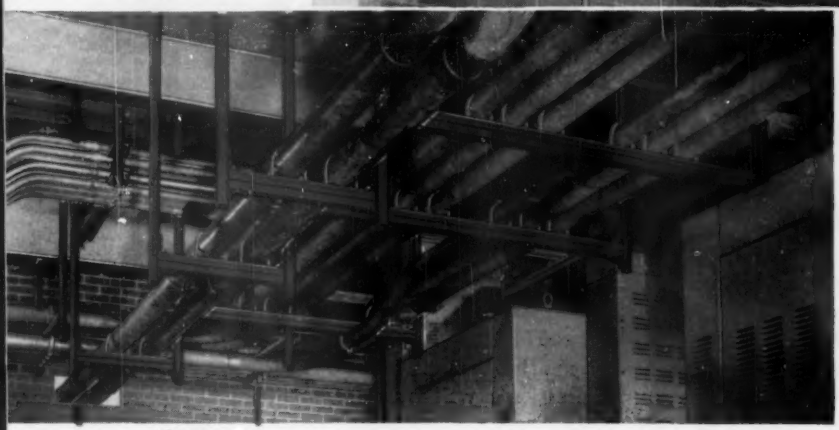
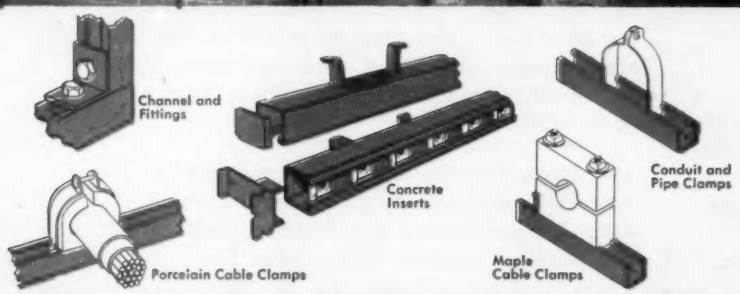
UNISTRUT concrete inserts, steel channel, fittings and clamps support maze of conduit in trapeze style framework.

ADJUSTABLE UNISTRUT FRAMING saves time, space, materials in large chemical plant



View shows how UNISTRUT nut and bolt assembly permits speedy erection, changes or additions at any time.





Conduit and Cable Installed Faster, Easier, for Less, at Kaiser Aluminum & Chemical Corporation's new Chalmette, La. plant

Versatile UNISTRUT steel structural supports reduce engineering detailing, permit rapid, on-the-job erection, allow changes or additions at any time.

This simple-to-assemble framing system consists of steel channel and fittings, clamps, brackets, hangers and concrete inserts—provides all you need to mount, frame, suspend or support all kinds of electrical equipment with just a hacksaw and a wrench.

No drilling, no welding, 100% adjustable and re-usable—there is no waste. Try UNISTRUT framing on your next job!

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THE WORLD'S MOST FLEXIBLE ALL-PURPOSE METAL FRAMING

Write for FREE 84-page Pocket Catalog No. 800
For the MAN ON THE JOB. Photos, drawings, ideas and data on how to frame, mount, rack and support electrical and mechanical equipment with UNISTRUT metal framing.

U. S. Patent Numbers
2327587 2329815 2345680
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2341988 Other Patents Pending

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UNISTRUT PRODUCTS COMPANY
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Chicago 7, Illinois Dept. E-12

Please send me a copy of Catalog 800 without obligation.

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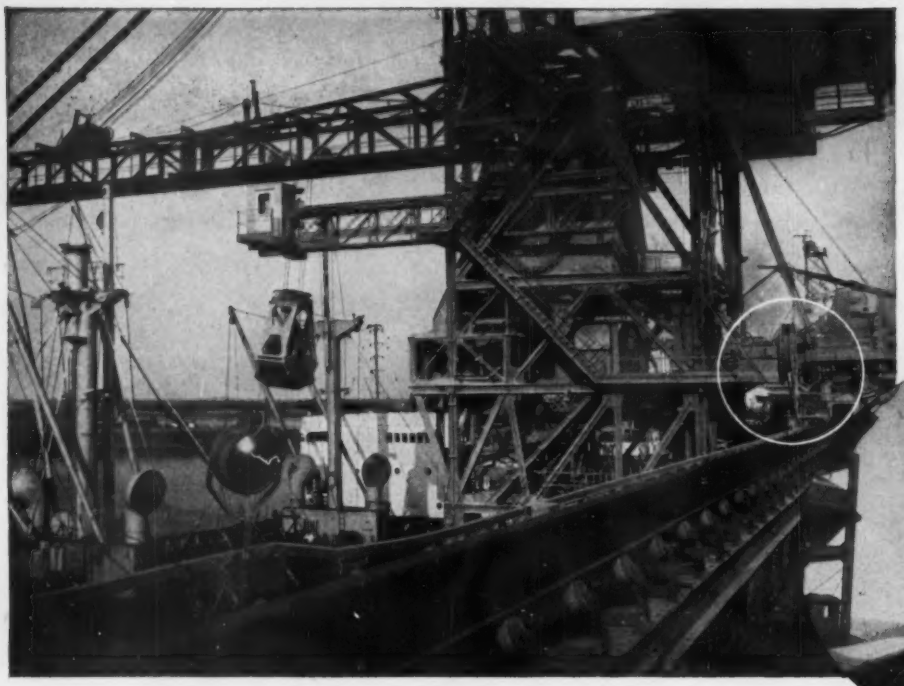
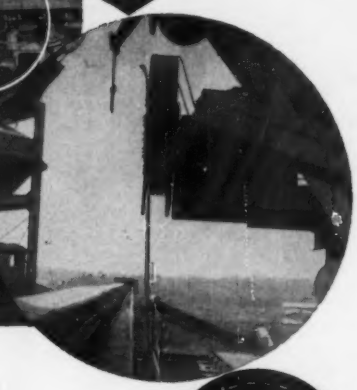
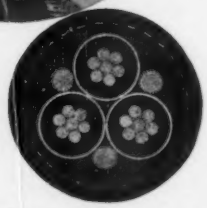


Alabama State Docks Bulk Material Handling Plant utilizes Hazacord in a unique take-up reel feeder for the overhead loading structure.

Close-up of the take-up reel shows the supporting bars for the cable alongside the conveyor belt.



Modern bulk material handling plant uses HAZACORD for SAFETY and DEPENDABILITY



Hazacord Type SH-D

Overhead loading structure power distribution at the new addition to the $5,000,000 Alabama State Docks Bulk Material Handling Plant at Mobile required a high safety factor as well as long-term dependability. Previous construction involved contactors riding on open bus bars which were frequently damaged by falling ore and were hazardous to personnel.

A constant torque take-up reel equipped with 650 feet of Hazacord Type SH-D supplies the power to the new loading structure. The 5,000-volt cable is supported as it is paid out by 14″ rods extending out from the side of the conveyor belt at 5′ intervals. The structure can move 630′ in either direction from the origin of the cable.

Such unusual installations as this indicate the wide variety of applications for the toughness and dependability of Hazacord Portable Cables. The tough Hazaprene sheath is resistant to the abrasion and compression as well as abuse from falling ore found in these operations. Weather resistance and the ability to withstand the attacks of acids, alkalies, moisture and most oils make Hazacords the logical choice for all portable power circuits up to 15,000 volts.

Your Hazard representative can recommend the correct Hazard cable for your requirements or write Hazard Insulated Wire Works, Division of The Okonite Company, Wilkes-Barre, Pa.

HAZACORD Mold-Cured portable cables

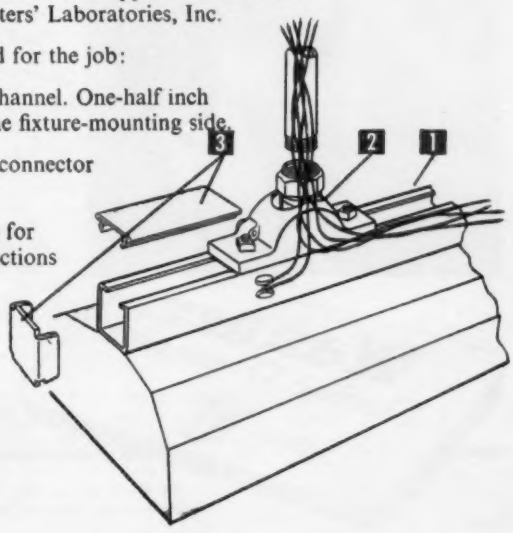
2134

Kindorf channel now approved by underwriters!

FIRST AND ONLY combination flush-mounting fluorescent fixture support and surface raceway to be approved by Underwriters' Laboratories, Inc.

channel and fittings specially designed for the job:

1. easy to wire patented "slot-up" channel. One-half inch knockouts on 6-inch centers in the fixture-mounting side.
2. special conduit-to-channel swing connector (patent pending)
3. end cap and snap-in closure strip for complete enclosure free of obstructions or sharp cutting edges.



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for further information contact your nearest Steel City agent

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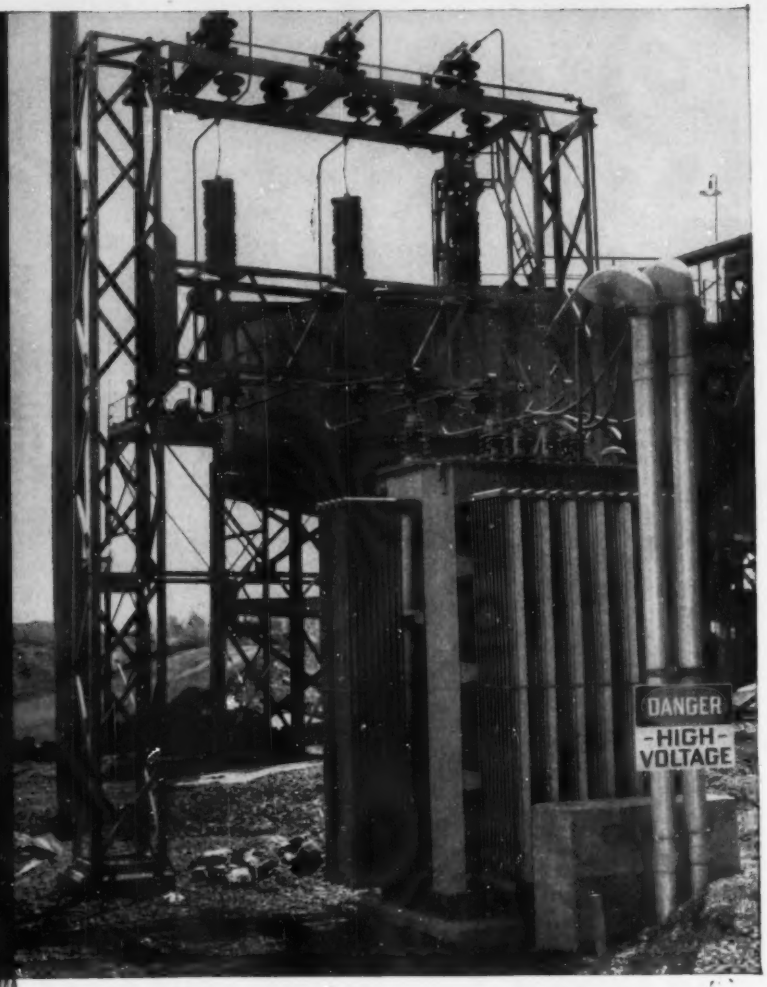
TRANSFORMERS
...the choice of leaders in industry

POWER for a man-sized job...



Taconite is an important word in the Mesabi Iron Country. As the supply of rich ore becomes scarcer, the mining companies are prepared to process taconite and lower grade iron ore for delivery to the nation's steel mills.

Processing taconite is a man-sized job. It is one of the world's hardest ores. It has to be crushed and ground to separate the iron particles from the rock and silica.

During the winter, the temperature in the Mesabi country often drops to 30° below zero. Tough jobs under operating conditions like this call for a plentiful supply of really dependable power. At the Nashwauk, Minnesota, mine of The Cleveland-Cliffs Iron Company, this power is delivered by Wagner Transformers. Shown above is the 3000 kva Wagner Power Transformer that furnishes power for this plant, and at the left is one of the Wagner 1000 kva Unit Substation Transformers that supply plant loads.

Wagner can also furnish motors especially designed for use in taconite plants. Your nearby Wagner engineer can help you select the right transformers or motors for *your* needs. Call the nearest of our 32 branch offices, or write us.

Wagner Electric Corporation
EST. 1891

WAGNER ELECTRIC CORPORATION
6413 PLYMOUTH AVE., ST. LOUIS 14, MO., U.S.A.

ELECTRIC MOTORS
TRANSFORMERS
INDUSTRIAL BRAKES
AUTOMOTIVE BRAKE SYSTEMS—AIR AND HYDRAULIC

We invite you to visit us at the 6th National Plant Maintenance and Engineering Show in Chicago—Booth #197.

T54-12

Washington Report

1954 ends on an optimistic note for the electric industry, marketwise and economically speaking. Electric power consumption continues to climb month after spectacular month, about 8% above a year ago levels. New building construction of near boom proportions climbs upward about 7% ahead of last year's record rate, now accounts for over 10% of the total (GNP) economy, or $37 billion out of a $356.5 billion estimated total for 1954. Auto production is swinging into full speed once again, steel mills are operating at over 80% of capacity, up from about 65% during summer months, and retail sales are now running about even with year ago levels. Electrical construction during the year has maintained a rate in excess of year ago levels, for the biggest volume on record. Outlook for the year ahead is for continued growth, for total volume of some 6 to 7% greater than this year.

Defense orders are being placed at rate about three times that of year ago—for planes, tanks, jeeps, guns, ammunition, and other military goods. Total orders in fiscal year ending last June 30, 1954 totaled up to $4.3 billion. Orders being placed in current fiscal year to June 30, 1955, will total $12.3 billion, of which $7.6 billion is for aircraft. This means orders backlogs will hold high, in many cases increase, and provide high level production in these fields over next two or more years.

New building construction has been the year's biggest prop in a lagging economy. Its record gets more spectacular month after month. Department of Commerce's estimate for 1954, made last December, was for a $34 billion total during this year—down $1.5 billion from 1953's record. Latest revised estimate as of mid-November is for new construction to reach a record breaking $37 billion this year, up $3 billion over the year ago estimate.

New construction activity in 1955 will set a still higher record of $39.5 billion, up 7% over this year, according to outlook estimates made jointly by Dept. of Commerce's Building Materials and Construction Division and Dept. of Labor's Bureau of Labor Statistics. Of this total, private expenditures are estimated at $27.4 billion, public outlays at $12.1 billion.

New residential building for 1955 is now estimated at $15 billion, up 13% over 1954 and at a rate of 55% of all private construction next year. Housing starts for 1954 are expected to total 1.2 million, and 1.3 million in 1955.

New Director of Electric Equipment Division. Business & Defense Services Administration, is Ray Bell, sworn in on December 6th to replace Clark M. Wright of Schenectady, N. Y. Mr. Bell has served as chief of the Transformer Section, EED, BDSA, for a period of one year, has been a consultant to the Division since the inception of BDSA, and comes to the Government from Allis Chalmers Company where he has been assistant to the vice president, in charge of production of transformers and switchgear.

Draft of tentative revision of Federal Specification for electrical outlet boxes (No. WO-821, Outlet Boxes, Steel, and new specification for nonmetallic outlet boxes) is in preparation, will be circulated shortly to industry, Government and others for comments. Draft is being handled by Electrical Equipment Division, BDSA, Washington, D. C.

Electric power production hit new peaks in November as steel and automotives production picked up. Weekly output was about 9.4 billion kwhrs, or 77% above 1947-49 average, and 11% above year ago records.

Man-days lost due to strikes over the first nine months of this year were down to 18 million, from a total of 23.2 million for the similar period of last year. Strikes were fewer and involved less workers during this period than in any comparable post-war period, according to BLS.

NEW T & B INSULATING BUSHINGS
for ½" to 6" Standard Rigid Conduit

T&B ENGINEERED

TOUGH... BEND 'EM, POUND 'EM, TWIST 'EM

These new T & B Insulating Bushings are designed to withstand rough treatment. Made of tough cellulose acetate butyrate, they're the toughest Insulating Bushings available today.

Use T & B's new Insulating Bushings wherever NEC requires protection for cable sheath or wire insulation against damage from burred or unevenly cut conduit... or for the ultimate in protection even where not required. Send today for a free sample and descriptive literature.

Toughest Insulating Bushing Avuilable Today... Can be used over and over again... shatterproof.

Vibration-Proof... Easily installed by hand, yet a wrench is needed to take them off. Bushing threads *lock* onto conduit.

Resists Corrosion... Unaffected by common acids, solvents, moisture or fumes.

Blue Color... Provides easy identification for electrical inspectors.

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IT'S THE MARK OF AN AUTHORIZED T & B DISTRIBUTOR

The complete line of T & B fittings for conductors and raceways is sold only by recognized electrical wholesalers. It's our way of assuring you the service and savings of a friendly local source. Call him for all your electrical needs. T44

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MANUFACTURERS OF FINE ELECTRICAL FITTINGS SINCE 1898

DECEMBER . . . . at a Glance

PROSPECTS ARE GOOD—Two of the most significant reports bearing on the next year's outlook for electrical construction activity have just been released. Both look like very good news for 1955.

The plans for capital expenditure by American industry are surveyed annually by the McGraw-Hill Department of Economics. The study just completed shows that industry is planning to spend within 5% of the amount it spent in 1954 for modernization of new plant and equipment for 1955.

American industry is demonstrating that it does not need the stimulus of war-created shortages, or a rearmament boom, in order to maintain a very high level of capital expenditure.

The impact of capital expenditure plans on electrical markets is obvious. New plants, new equipment or modernization of existing plants and processes all entrain large requirements in electrical equipment, materials and services.

A joint release by the U. S. Department of Commerce and the U. S. Department of Labor foresees a new construction record in 1955, a 7% increase to reach a $39½ billion total. It estimates that both private and public construction will set new records. Residential and commercial volume is expected to run as much as 13% ahead of 1954.

Electrical prospects in such an outlook ought to be excellent. Progress in lighting application standards and increases in electrical requirements virtually across the board are requiring a larger share of the building dollar for electrical work.

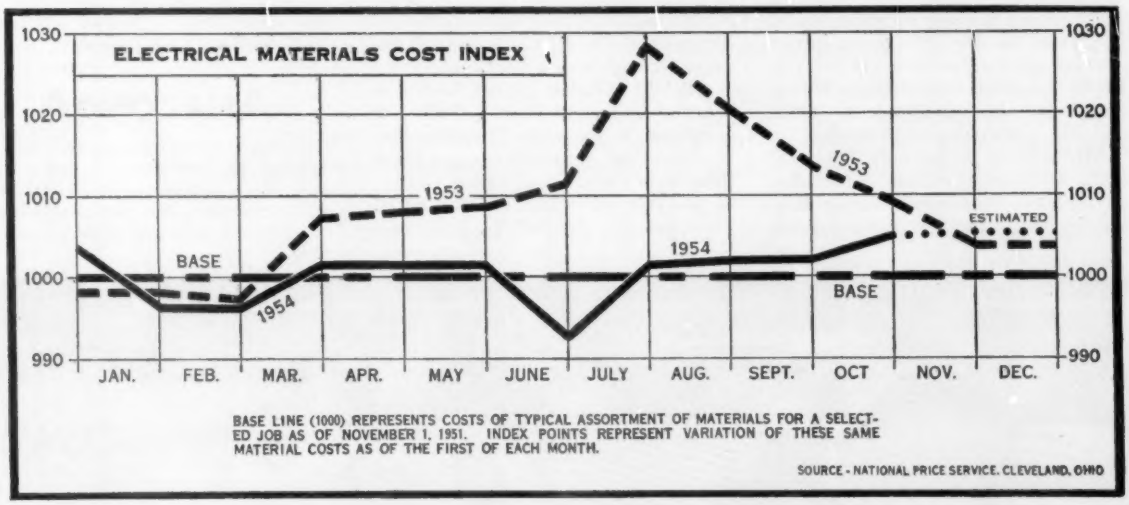
Our first issue of 1955 will carry in detail an annual summary and forecast of electrical prospects. It looks, from the accumulating data, like a good year ahead.

THE FAMILY GROWS—*Electrical Construction and Maintenance* will begin the new year with over 30,000 paid subscribers. While the circulation growth was planned several years ago we are happy to note that it was reached several months ahead of schedule. We like to think that this is a reflection of our editorial efforts to turn out the most constructive and useful publication we know how to produce for the industry. In any event the larger "family" means more responsibility and, immediately ahead, a bigger and better publishing job for 1955. And the milestone passed is a good opportunity to express our grateful appreciation for the interest and loyalty of our good readers as well as a very Merry Christmas and a happy and prosperous New Year to all.

SIGNS OF PROGRESS—Walking down through rows of spectacular switchgear equipment under construction at Federal Pacific's new Scranton, Pa. plant a discerning eye with a little historical perspective could note symptoms of a profound change in the electrical business. Many of the equipments, which bore little signs identifying the customers or prospects for which they were destined, carried the names of well known electrical contractors. Not so long ago practically everything over 440 volts was utility gear made for the line side of the meter. Now-a-days 4,700 or 11,800 volts, while hardly common-place, are at least conventional for industrial distribution.

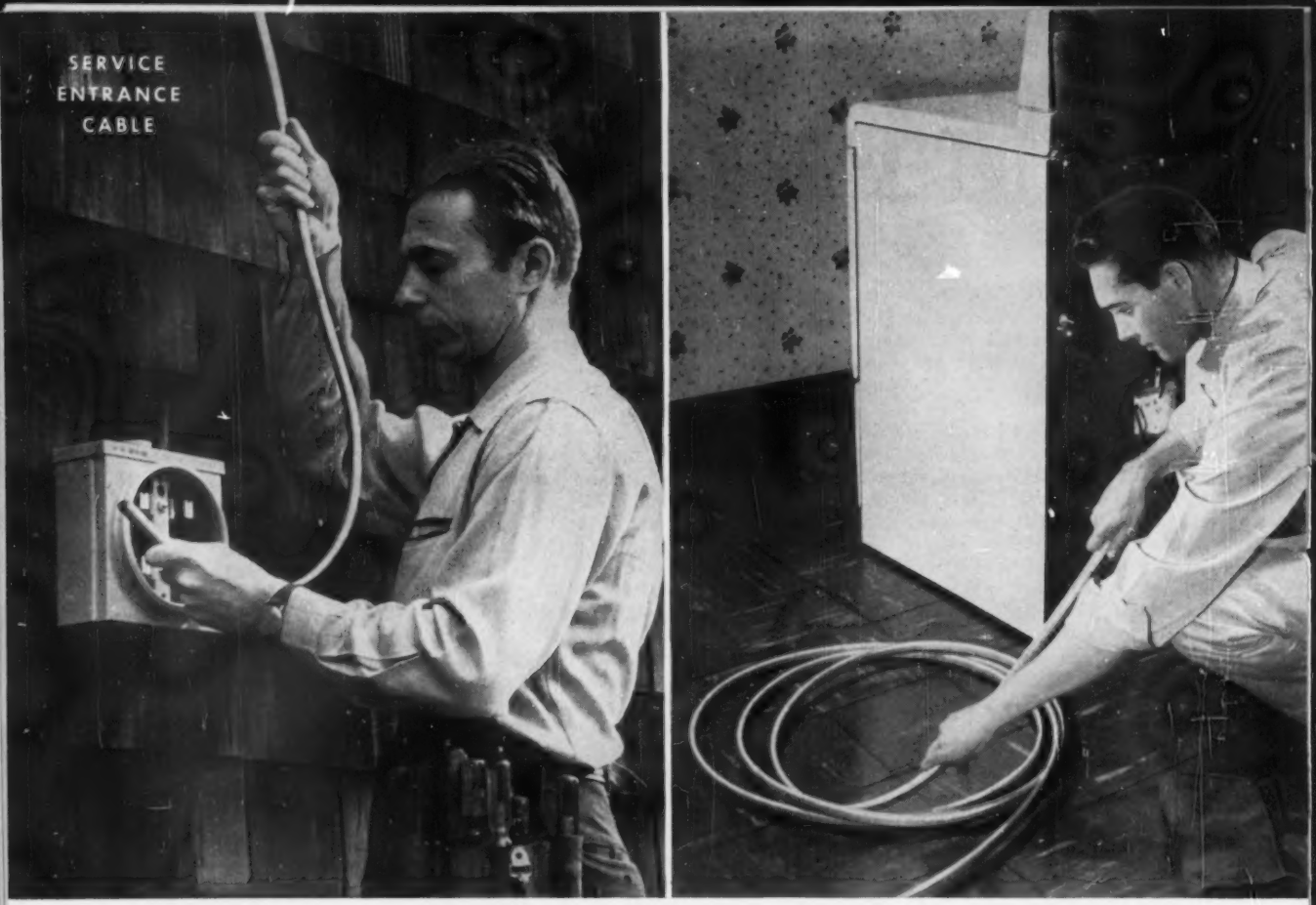
The development of totally-enclosed, free-standing switchgear and transformers suitable for in-plant use and the concurrent development of cable insulations as well as splicing and terminating techniques have particularly given an entire new scope to interior electrical distribution design.

THAT LIVELY CODE—At the New Orleans convention of NECA a panel of Code experts, Karl Geiges of U.L., C. L. Smith of NFPA and B. A. McDonald of IAEI literally "stopped the show" and their portion of the program had to be carried over into long extra sessions on the insistent demand of the audience. The Code can be a lively subject when top experts handle the questions.



BASE LINE (1000) REPRESENTS COSTS OF TYPICAL ASSORTMENT OF MATERIALS FOR A SELECTED JOB AS OF NOVEMBER 1, 1951. INDEX POINTS REPRESENT VARIATION OF THESE SAME MATERIAL COSTS AS OF THE FIRST OF EACH MONTH.

SOURCE - NATIONAL PRICE SERVICE, CLEVELAND, OHIO



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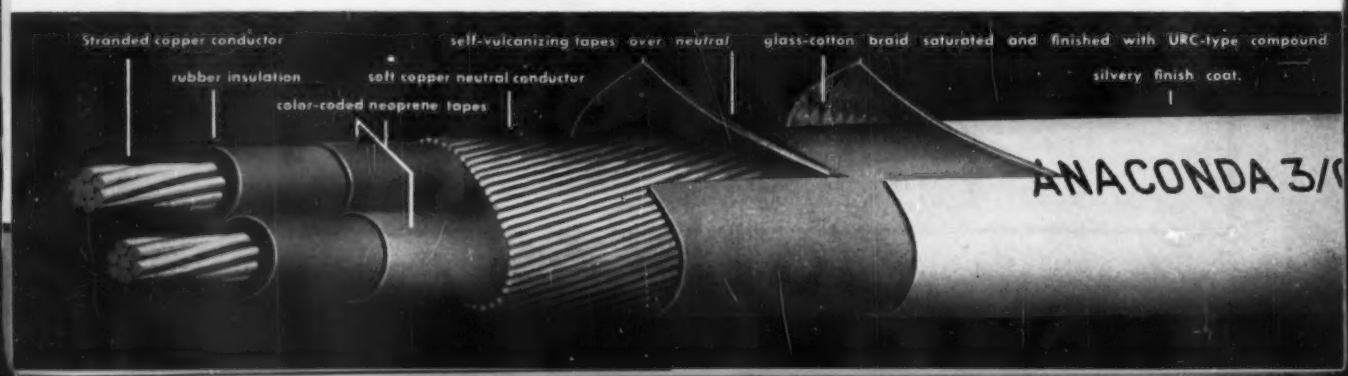


ELECTRICAL CONSTRUCTION AND MAINTENANCE

54th Year—DECEMBER • 1954

Visual Environment

The concept of the visual environment might well rank as the most fundamentally important electrical development of this decade. Its impact will eventually affect not only the lighting industry but the electrical industry as a whole. It will need more wiring for greater load density and it will also influence air conditioning loads.

Since the fluorescent lamp appeared in the late 30's, practical illumination of 100 footcandles and more has presented no great technical problem. Applied lighting has quite logically developed specifically around the illumination of the seeing task.

Lighting fixture design has greatly increased acceptable levels of illumination by maximizing lumen output while shielding lamps from view at normal angles of vision. So good lighting applications even if designed primarily for seeing task illumination also result in a substantial improvement of the visual environment.

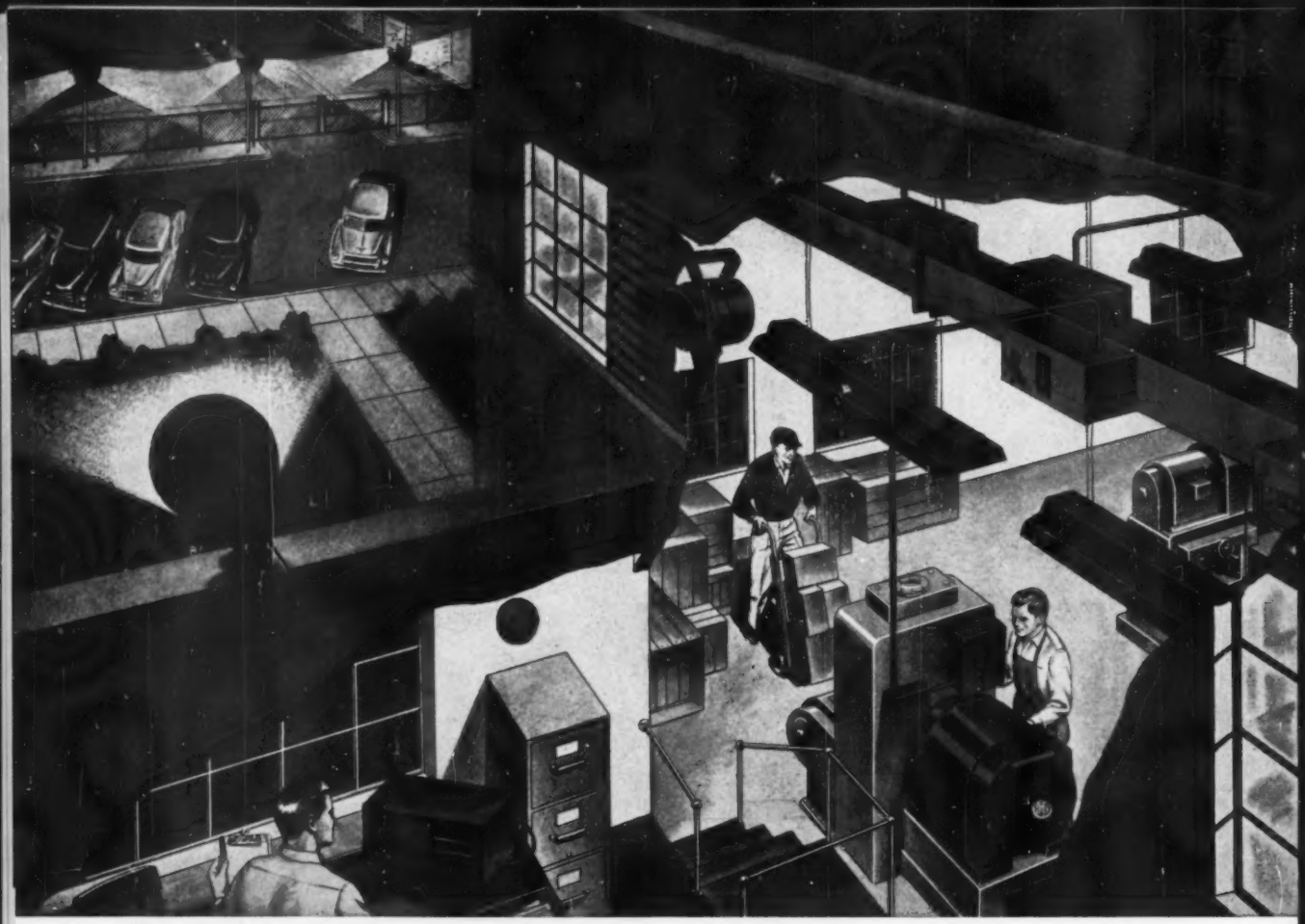
As design moves beyond 100 footcandles, however, the relationship between the seeing task and the surrounding visual environment changes. Light at such levels is well above the minimum essential to see by. It is moving toward the quite new objective of optimum visual efficiency.

With conventional footcandle engineering the resulting visual environment is incidental, often accidental. Yet without proper consideration of the visual environment it is evident that illumination of the seeing task eventually reaches a point of diminishing return in visual efficiency and comfort.

By designing the lighting system and treating the surrounds as a single broad problem of environment engineering much higher illumination levels, with consequent improvement in visual efficiency, are comfortable and acceptable. Then the specific **needs** of a particular seeing task are inherently satisfied within an appropriate and efficient visual environment.

Environment engineering is an important break-through to new horizons of lighting performance. The prospect of practical artificial lighting with all the comfort and visual efficiency of the natural lighting under which the human eye evolved may be closer than we realize.

Wm. T. Stuart



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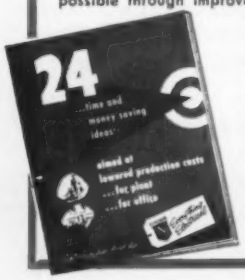

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4. Graybar Specialists in all of the major electrical fields are always available for consultation on out-of-the-ordinary projects. You can rely on them for careful analysis of your customer's requirements and complete impartiality in product recommendations.

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ELECTRICAL CONSTRUCTION AND MAINTENANCE

VOL. 53—No. 12

NECA District vice presidents elected at New Orleans are: John A. Beck (Dist. 2), Baltimore, Md.; F. E. Keith (Dist. 7), Des Moines, Ia.; J. W. Albright (Dist. 4), Detroit, Mich.; W. R. Grasle (Dist. 6), Portland, Ore.; W. P. Robbins (Dist. 8), Salt Lake City, Utah.

Norman C. Wicks, manager, National Adequate Wiring Bureau, New York City; NECA president, D. B. Clayton, Sr., Electric Constructors, Inc., Birmingham, Alabama.

Harold A. Webster, T. Frederick Jackson, Inc., New York, presents the McGraw Award Contractors Medal to Oliver F. Burnett, Jr., Kelso-Burnett Electric Co., Chicago.

NECA Meets in NEW ORLEANS

Contractors hold record convention; adopt new charter and by-laws; see electrical modernization as the growth market; censure labor "fringe" benefits, material substitution and government supply of material. O. F. Burnett, Jr. receives McGraw Award.

A FIFTEEN to twenty billion dollar electrical modernization market awaits the electrical construction industry in this country. That was the forecast heard by more than 1,900 members and guests attending the 53rd Anniversary Convention of the National Electrical Contractors Association in New Orleans, Oct. 26-30. During the four-day meeting, delegates heard industry leaders unveil programs designed to guide contractors to this target. At closed sessions and in committee rooms, they adopted a new association charter and by-laws and offered resolutions on ethics and uneconomic practices within the industry.

In his keynote address at the opening session, NECA president D. B. Clayton, Sr., Birmingham, Ala., pointed up this $20 billion modernization market with a prediction that it would provide an average of $250,000 additional annual volume for each NECA member on a ten-year basis. Mr. Clayton was critical of those contractors who take the cream of the work and leave a tremendous volume of small work units for others to do—or be left undone—just because they don't happen to like that type of work. Specifically, he listed the following markets which many NECA contractors have bypassed: line construction, farm wiring, industrial maintenance, residential, commercial modernization, and automatic control.

Much of this work can be sandwiched between new construction contracts, Clayton noted, to maintain an even volume and steady labor payrolls. NECA members are not living up to their responsibilities as representatives of the entire industry until such time as they serve the entire industry instead of concentrating on a few branches as they do now, he told the delegates. Labor is going to have to be sold on complete cooperation with contractors to gain the ground both want and need (residential, utility and main-

LEFT TO RIGHT—Alfred V. Bartlett, Sr., Rust Electric Co., Inc., Providence, R. I.; Whitworth Ferguson, Ferguson Electric Construction Co., Inc., Buffalo, N. Y.; and George F. Butler, Beacon Electric. Eng. & Const. Co., N. Y.; Jorge Tellez, Ohio Pipe Trades, Inc., Toledo; Ray Scannell, Scannell Electric Co., Toledo; Clarence F. Hammer, manager, Toledo Chapter, NECA; Morris Dorn, Dorn Electric Co., Maumee, Ohio; Sydney C. Blumenthal, Blumenthal-Kahn Electric Co., Inc.; John A. Beck, The Eastern Electric Co., Inc.; Philip Stinchcomb, Philip Stinchcomb, Inc., all three of Baltimore, Md.

Winston Whitney, Whitney Electric Co., Colorado Springs, Colo.; John Sroufe, Northwest Electric Co., Seattle, Washington; J. M. Alexander, Hatzel & Buehler, Inc., Wilmington, Del.; R. A. Goeller, Sr., and R. A. Goeller, Jr., Hatzel & Buehler, Inc., New York City; O. H. Batzli, Batzli Electric Co., Minneapolis; A. C. McCann, Parsons Electric Co.; Minneapolis; John Kvalsten, Kvalsten Electric Co., Minneapolis; D. F. Kehne, Kehne Electric, Inc., St. Paul; D. M. Gephart, NECA, St. Paul.

tenance work). "We (NECA members) must unite and remain united to accomplish the things that we need to continue to hold control of our industry," Clayton added. Staff reports by executive vice president Paul M. Geary and secretary-treasurer Clint J. Harder reviewed association progress during the past year. Mr. Harder reported a net gain of 114 members this year (309 new members less 195 dropped) to bring the total as of Sept. 30, 1954 to 3,389. Of these, 3,128 belong to the 107 Chapters; the others are "individual" members.

Mr. Geary related the headquarters and chapter activities, noting that NECA had participated in the Diamond Jubilee Farm project, cooperated in the establishment of the National Lighting Bureau and assisted in getting NAHB to adopt a 100-ampere service standard for new homes. Efforts are still being made to reverse the uneconomic practice of government agencies and owners furnishing materials on electrical projects. While NECA failed to secure action on the enactment of a Federal Construction Contract Act (Senate Bill S.848 and H. R. Bill 1825) in the 83rd Congress, the construction and electrical industries were alerted to the wide extent of bid peddling and bid shopping evils, he noted. One encouraging development is a recommendation of the Associated General Contractors board of a subcontractor bid form incorporating the AGC Code of Ethics and strict adherence to it.

An explanation of the operation and status of the IBEW pension fund was given to the general membership by IBEW international president J. Scott Milne. From a start of $1,886,000 in 1947, prior to the 1% agreement between NECA and IBEW, the fund has grown to a total of some $52,700,000. This includes increased contributions by the 300,000 "A" members, contractor contributions and some $7,000,000 borrowed, to date, from local unions for reinvestment to enhance the fund. Some 5,983 members are on pension today, representing about two-thirds of those eligible for pension. Milne reported that electrical contractors employ 123,000 "A" men and are paying 1% into the fund, and attempts will be made to have the non-paying employers of 177,000 other "A" members do likewise. By 1961 Milne expects the pension roll to increase to 11,000 men and, by 1980, to 40,000. The ultimate goal is to pay $100 per month pension to each eligible member.

Line Constructors

Charles W. Moseley cited the accomplishments of the committee over the last six years in resolving problems which long plagued electrical pole line contractors. The machinery has been set up for rapid progress on a national scale. However, the big need of line constructors is for organization at the local level. Only by local cooperation and development of operating machinery can the competitive scramble for line work be brought under control, he said.

Bill Damon, NECA director of Apprenticeship and Training, presented to the meeting the outline for a new NECA course for linemen apprentices. This three-year basic training course, supplementary to training on the job, is basically a correspondence course. It was set up this way because attendance at school would be impossible for the great majority of outside apprentices who are spread out far and wide in the open spaces of the country.

Labor Relations, Codes, Standards, Research

The third general session was under the chairmanship of District Vice President S. F. Hill, of Los Angeles,

W. R. Grasle, W. R. Grasle Co., Portland, Ore.; G. B. Schetky, Western Electrical Construction Co., Portland; John B. Majerus, NECA, Seattle, Wash.; D. W. Wright, Miller-Seldon Electric Co., Detroit; Francis F. Tufts, John H. Busby Co., Detroit; Donald Cates, Cates-Trueman Co., Berkley, Mich.; Albert B. Blixt, F. J. O'Toole Co., Detroit; V. P. Sarin, Sarin Electric Co., Detroit; F. M. Hydon, Hydon-Brand Co., Detroit; C. M. Mathieu, Mathieu Electric Co., Corpus Christi, Texas; J. H. Fuqua, Weisfeld & Son, New Orleans; H. C. Hamilton, Hamilton Electric Co., Lubbock, Texas.

C. E. Wann, NECA; Fred Schmidt, State Electric Co.; T. C. Metcalfe, Metcalfe Electric Co.; J. E. Burton, Burton Bros. Electric Co.; G. C. White, Empire Electric Co., Inc., all from Fort Worth, Texas; L. T. Allen, Allen Electric Co.; H. Y. Strader, NECA; and George Taylor, all from Tulsa, Okla.; M. G. Todd, Todd Electric Co., Norfolk, Va.; J. M. Richardson, Richardson-Wayland Electric Corp., Roanoke, Va.; H. I. Tuck, Jr., Tuck & Kendall, Inc., Norfolk.

and was devoted to reports on labor relations, codes and standards, and research, with open forums following each report.

The report on labor relations was given by William J. Cour, of NECA headquarters, who gave a brief round-up of activities. He called on "Bill" Damon, NECA headquarters, for his report on National Joint Apprenticeship Training Courses, and on O. F. Burnett of Chicago for a report on a Supervisory Personnel Training Program which it is proposed be sponsored by NECA.

The Apprenticeship Training program has been reactivated following a period of lethargy in 1953, Mr. Damon said. There are now 23 training programs in operation, and 30 states have set up Apprenticeship Councils, he reported.

W. D. Howell of the National Electric Benefit Fund reported on the activities of the National Benefit Committee. He stated that more than 123,000 IBEW members are now hired by NECA contractors, and that about 6000 IBEW members are on pension at this time.

The proposed Supervisory Personnel Training Program, which would be carried out within the training framework of the Training Within Industry Foundation, was explained in detail by O. F. Burnett. Under TWI, which was set up in 1940 by the Council of National Defense to train the thousands of workers entering American industry, some 200 TWI conductors trained 23,000 trainers, who trained about 1,750,000 supervisors, and these in turn supervised some 10 million war workers, Mr. Burnett said. TWI recommends that four subjects—discussion leading, job instruction, job relations, and job planning—be included in the proposed NECA program, which is strictly voluntary and offered for those who may want it, he advised. There are two ways to improve profit, Mr. Burnett pointed out: get a better price for work, or reduce cost. With 40 cents of every dollar being spent by the electrical foreman for labor, individual contractors should carefully analyze how this 40 cents is spent. Getting the men to work is a problem in human relations, he said, but the men may not know how to work, in which case training is the only answer.

The report of the Codes and Standards Committee was given by W. H. Biester, Jr., of Philadelphia, Pa., chairman of the committee, covering only the highlights of activities. As a highlight of the session, Mr. Biester introduced a three-man guest panel which he had invited to the Convention to answer questions raised during the forum session. These guests were: Carl Geiges, chief engineer, Underwriters' Laboratories, Inc., Chicago, who is chairman of NE Code Committee Panel No. 15; Charles L. Smith, executive secretary, International Association of Electrical Inspectors, and chairman of the National Electrical Code Clearing Committee; and B. A. McDonald, Rochester, N. Y., President of International Association of Electrical Inspectors. Mr. McDonald was the session's keynote speaker and talked on the relationship between electrical inspectors and electrical contractors.

The protection and safety of the public against electrical hazards is the joint responsibility of inspectors and electrical contractors, Mr. McDonald said. He then described the various types of inspectors and contractors, and told how they can each cooperate with the other to best advantage to achieve their common goals.

During the forum session following Mr. McDonald's address, the NECA members and guests expressed keen

LEFT TO RIGHT—John D. Hilburn, Bolses-Hilburn Electric Co., Kansas City, Mo.; Frank C. Smiley, National Electrical Construction Co., Kansas City; C. W. Moseley, R. H. Bouligny, Inc., Charlotte, N. C.; Davis H. Elliott, Davis H. Elliott Co., Inc., Roanoke, Va.; Albert A. Anderson, New Britain, Conn.; Leonard W. Johnson, Johnson Electric Co., Chicago, Ill.; Clifton W. Whitmore, Whitmore Electric Co., and Vernon Holloway, Interstate Electric Co., both from Miami, Fla.

M. R. Minto, MacNutt Electric Co., Inc.; H. A. Webster, T. Frederick Jackson, Inc.; L. C. MacNutt, MacNutt Electric Co., Inc., all from New York City; E. G. Fisk, NECA, Little Rock, Ark.; R. C. Pfluger, Pfluger Electric Co.; Frank Prattini, Brignac Electric Co.; R. Viener, Jr., NECA, all from New Orleans, La.; R. E. Libecap, Libecap Electric Co.; J. L. McClure, McClure Electric Co.; Lawrence Martin, NECA; P. L. Porter, NECA; and W. E. Butcher, Butcher Electrical Service; all from Dallas, Texas.

interest in Codes and Standards problems, so much so that by popular request the forum was reconvened for an afternoon session that day, and again for the morning session on the following day.

The report on the progress of NECA's Research Committee over the past year was made by E. L. Buttner, chairman, of Oakland, Calif. Work of this committee includes the Educational, Labor Cost Data, Operation and Overhead Expense Data, and Marketing Data programs, he explained, and then outlined the activities under each program.

NECA members next reported on office methods being used by them which might be of interest and value to other members.

W. R. Grasle, of Portland, Ore., described a time card system used by his firm in developing improved labor data, which he explained was worked out to provide the information wanted, after first deciding just what data were needed and wanted.

William F. McCarter of Cates & Shepard, Philadelphia, described how data were collected on a large newspaper plant electrical installation in Philadelphia. Overall data on the entire job were obtained, through a plan worked out jointly between his firm and E. R. Cornish of the NECA headquarters staff.

John A. Beck, Eastern Electric Company, Baltimore, described a time card system his firm developed and used to provide segregated labor data.

Donald W. Close of Seattle, Wash. told of a time card record system he has adopted for developing cost data, which he uses on each job for developing mass statistics. This system uses a weekly record time card, with twelve separate segregations for breakdown of job labor into the various classifications.

Business Promotion Plans

The NECA Business Development Committee Report was offered by Lyle N. Foster, chairman.

Under the limited budget, national advertising expenditures must be curtailed drastically, the committee reported. What will be done will be of a serious, dignified nature to "keep before the public the name and value of the NECA qualified electrical contractor". While last year's program was considered successful in areas where chapters cooperated, it was labeled unsatisfactory where chapters did not participate. Less than one-fourth of all NECA chapters carried on local promotional campaigns. The committee admonished those chapters and individual contractors for their general lack of interest and neglect to follow through. This year, strong emphasis will be placed on local chapter operation of an electrical modernization campaign, the committee stated.

During the forum on Business Promotion, E. C. Huerkamp, chairman, executive committee, National Lighting Bureau, outlined the details of a NLB promotional campaign designed to sell more lighting to factories, stores, offices and schools in dire need of relighting. More than 85% of these buildings in the average American city have lighting that is below recommended I.E.S. standards, he noted, adding that a $5,000,000,000 market (based on a conservative estimate by *Electrical Construction & Maintenance*) exists in this field, if only one out of five existing industrial and commercial buildings were sold.

Also on the business development forum panel was Norman C. Wicks, manager, National Adequate Wiring Bureau. The Adequate Wiring program, like NECA's business development program, needs the help of the individual contractor and the enthusiastic support of local chapters, he told the delegates. Now, more than ever, is the time to take advantage of the

J. M. Nairn, Superior Electric Co., Jersey City, N. J.; George E. Davis, A. L. Davis Co., Inc., Newark, N. J.; J. D. O'Conner, Luppen & Hawley, Inc., Sacramento, Calif.; R. L. Wilkinson, manager, Inland Empire Chapter, NECA, Spokane, Wash.; Rex Morre, Jr., and Al Perry, Rex Moore Co., Sacramento, Calif.; R. Stahmer, Industrial Electrical Works; P. H. Kenworthy, Kenworthy Electric Co.; E. J. Grafentin, Sterling Electric Co., all from Omaha, Neb.

L. C. Penwill, A. F. Plummer and J. G. Briggs, officials of the Electrical Contractors Association, Inc., London, England; E. L. Buttner, Scott-Buttner Electric Co., Inc., Oakland, Calif.; T. C. Metcalf, Metcalf Electric Co., Ft. Worth; J. L. McClure, McClure Electric Co., Dallas, Texas; Fred Schmidt, State Electric Co., Ft. Worth; E. C. Carlson, Carlson Electric Co., Youngstown, Ohio; R. W. McChesney, Harry Alexander, Inc., Washington, D. C.; L. E. Mayer, Hyland Electrical Supply Co., Chicago, Ill.; A. L. Bush, Belmont Electric Co., Inc., New York City.

national awareness of inadequate wiring in the home, he added, noting the several pay-as-you-go plans now in existence throughout the country to finance home rewiring. The electrical industry can't afford to debate as to who is going to do the job. The contractor should take the initiative on the local level, for he is "the industry's main street salesman where wiring is concerned," Wicks concluded.

Elections and Resolutions

Five District vice presidents were elected at the closed business session. They are John A. Beck (Dist. 2), Baltimore, Md.; J. W. Albright (Dist. 4), Detroit, Mich.; W. R. Grasle (Dist. 6), Portland, Ore.; F. E. Keith (Dist. 7), DesMoines, Ia.; and W. P. Robbins (Dist. 8), Salt Lake City, Utah.

Following careful study, the delegates adopted a new Association Charter and By-Laws at the closed meeting. Basically, the new charter directs responsibility for association operation to the Board of Governors.

Several important resolutions received unanimous approval at the closing session. Members reaffirmed a resolution "Public Interest in Collective Bargaining" adopted at its 1953 convention. In it, NECA admonishes its chapters and the local unions with which they bargain to do some objective market research and determine how they can continue to serve the public better than anyone else in a more competitive market. Basically it means taking a closer look at labor "fringe" benefits and wage rates before they find themselves priced out of the market.

By means of another resolution the association condemned the practice of government furnishing construction materials.

A third resolution condemned as unethical the practice of taking advantage of the "or equal" clause in specifications to substitute inferior or less costly material or equipment.

The Revised Schedule of Electrical Symbols for Architectural Drawings developed by A. C. McWilliams of Chicago was given due recognition by a resolution urging wide distribution of this schedule throughout the electrical and construction industries as well as architectural and engineering associations throughout the U. S. and Canada. The resolution further paid tribute to Mr. McWilliams for his work which is now awaiting approval of the American Standards Association.

Other resolutions paid tribute to Erne C. Carlson, Youngstown, Ohio, chairman of the NECA Labor Relations Committee, upon his retirement from official capacities; and to the five retiring district vice presidents: O. H. Taylor, Toledo; O. F. Burnett, Jr., Chicago; E. L. Buttner, Oakland, Calif.; F. J. Oertli, St. Louis; and C. H. Simpson, Cheyenne, Wyo.

McGraw Award

Oliver F. Burnett, Jr., president, Kelso-Burnett Electric Co., Chicago, received the James H. McGraw Award Contractor's Medal during an effective ceremony at the opening convention session. Flanked by an honor escort of four contractor Medalists, Mr. Burnett received the award from Harold A. Webster, Industry Member, Awards Committee, in recognition of his outstanding and constructive leadership in the development of creative methods for business promotion in the electrical contracting industry.

The panel of judges who recommended Mr. Burnett for this honor consists of: E. W. Frazer, H. B. Frazer Electric Company; L. C. MacNutt, MacNutt Electric Company, Inc.; E. J. White, Edward J. White Company; A. H. Wilson, Electrical Construction Co., Inc.; and H. A. Webster, T. Frederick Jackson, Inc.

Lighting is Architectural

LIGHT is a key factor in the architectural design of New Orleans' new Union Passenger Terminal building. It floodlights the building entrance facade from concealed sources, and forms the principal decorative treatment for the lobby and main concourse, or waiting room.

The new Terminal replaces five antiquated and widely scattered passenger stations in New Orleans, which formerly served seven railroads. It is part of a comprehensive project of modernization of railroad facilities in the Louisiana city, which also includes the relocation of miles of roads and rails, the filling of a navigation canal, and the construction of 25 grade separation structures.

Electrically, the entire project has involved many interesting problems. For example, each underpass requires heavy pumping capacity to automatically drain the structure of the proverbial New Orleans' downpours for which the city has no natural drainage. But probably the most interesting electrical problems have been those associated with the Terminal building.

New Orleans' new Union Passenger Terminal is neither unusually large nor unusually sumptuous. Yet it is adequate for its purpose, dignified in appearance, and comprehensive in its plan. The building is completely air conditioned, light conditioned, and sound conditioned. It has a two-story main entrance, which is floodlighted, and two similar side entrances. A lobby, 44 feet wide by 61 feet long, leads from the main entrance to a luggage counter, posting board and main clock which occupy the center of the spacious waiting concourse. The concourse is 69 feet wide by 242 feet long, with an 18-ft 6-in. high ceiling. The main floor also includes telephone foyers, sanitary facilities, two restaurants and a cocktail lounge, offices, and other concession spaces. The second floor, over the front half of the building, contains railroad offices, telephone room, electrical equipment room, and two air conditioning blower rooms. The main air conditioning machinery, however, is housed in an adjacent two-story baggage building.

Electrical Distribution

Primary electrical power distribution in the station yard is by 13,200-volt, self-supporting aerial cable. One 500 kva transformer station on the roof of a train canopy serves the station building. Another 500 kva sub-station on the roof of the baggage building serves that building and the main air conditioning machinery located directly below. It also serves the emergency lighting throughout the terminal.

Secondary distribution is 120/208-volt Y, radial, with two distribution centers, one in each building.

Branch circuits for receptacles in office areas and in some concession areas are installed in Nepco underfloor metal ducts placed in lightweight concrete fill over structural slabs. All ducts are double runs to accommodate telephone lines in addition to receptacle branch circuits. Underfloor ducts were also installed around the periphery and down the center of the waiting concourse to serve electrical requirements of possible feature display and service booths.

Lighting branch circuits are generally installed in accessible attics, except over second floor office area where no attic space is available. Here a grid system of conduits and outlets, coordinated with windows and air outlets, permits considerable flexibility in relocating movable partitions.

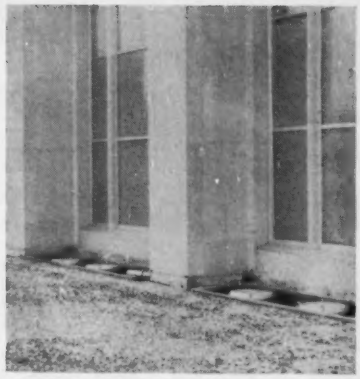
Some degree of standardization of lighting schemes and lighting equipments was attempted for this terminal building, notwithstanding the need for a variety of such schemes and fixtures for the many and sundry facilities. In general, fluorescent lighting is used. All permanent offices and most concession areas are lighted by lens bottom troffers. All offices with movable partitions are lighted with surface-type louver fixtures. All luminaires are equipped with 40-watt instant-start type lamps, except those in the lobby and waiting concourse, which use 8-foot slimline lamps arranged for attic relamping.

Offices and most concessions are designed for 50 footcandles maintained, using continuous rows of fluorescent troffers or surface-type luminaires.

The most interesting area, architec-

Custom lighting system blends harmoniously with architectural design of New Orleans' new Union Passenger Terminal, provides high level of comfortable illumination throughout, embraces engineered maintenance features.

By Louis N. Goodman and Mario G. Zervigon
Louis N. Goodman and Associates, Consulting Electrical Engineers, New Orleans, La.



THREE FLOODLIGHTS, each 500-watt, are recessed in trough in marquee roof to floodlight each window recess.

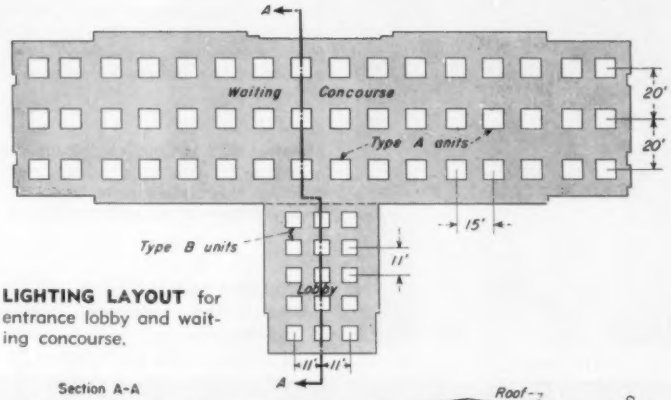
Feature of New Terminal

turally and from the lighting point of view, is the T-shaped combination of lobby and waiting concourse. This spacious area with its wide expanse of dark, highly polished marble, large aluminum grilled end windows, and extensive richly colored murals on the upper walls, offered an opportunity and a challenge. With the architects, the engineers, and the lighting equipment manufacturer working as a team, a lighting system was developed which proved both efficient and architecturally effective.

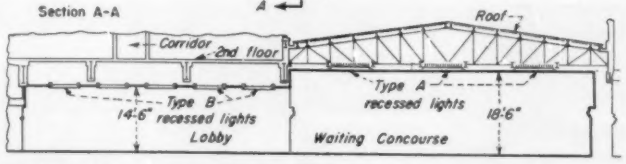
The waiting concourse is lighted by 48 96-inch square recessed custom-designed and custom-made units which were built into the ceiling in three separate rows. The rows are 20 feet on centers, and the units are 15 feet on centers in the rows. The rows are given continuity by plaster moulding (see picture), except for the end units which are framed individually.

Each concourse unit contains eight 96-inch T-12 slimline lamps wired in two circuits. One circuit controls two lamps in each unit, for low level lighting, and the other circuit controls the other six lamps for a higher level lighting. The average illumination maintained with all lamps on is 35 footcandles.

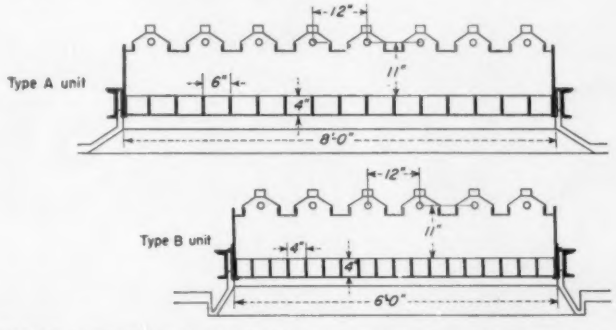
Below the lamps and reflectors are louvers designed for 35 degree shielding. The louvers are made of ¼-in. by 4-in. solid aluminum bars anodized, which are joined together to form 6-in. by 6-in. cells, 4 inches deep. Louvers



LIGHTING LAYOUT for entrance lobby and waiting concourse.



SECTION A-A through lobby and waiting concourse showing location of special lighting units Type A and Type B.



DETAILS of Types A and B lighting units, which are maintained from above.

WAITING CONCOURSE has 48 recessed louvered luminaires each 96-in square, equipped with eight 96-in T-12 cool white fluorescent lamps. Lighting intensity is 35 footcandles. Incandescent downlights highlight posting board on right. Air diffusers and speakers are recessed in acoustic tile ceiling between luminaire rows.

LUMINAIRES in lobby have louvers made of ¼-in by 4-in solid aluminum bars, forming 4-in square cells. Speakers are recessed flush in acoustic tile ceiling.

ENTRANCE LOBBY has 15 6-ft square luminaires which provide 40 footcandles of illumination.

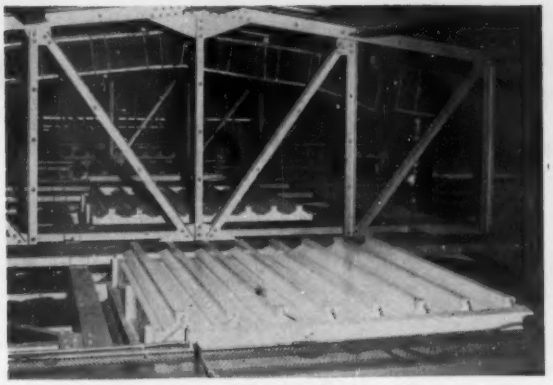
will support weight of a man standing on them from above when cleaning becomes necessary.

The entrance lobby, with a louver ceiling height of 14-ft 6-in., uses 15 similar units except that they are 72-in. by 72-in., equipped with six slimline lamps, and the louver cells are 4-in. by 4-in. with 45 degree shielding. These units are framed as individual squares by plaster moulding. In order to standardize on lamp size, these lobby units are 6-ft by 8-ft above the ceiling, and accommodate 96-in T-12 slimline lamps. The illumination intensity in the lobby area is 40 footcandles maintained.

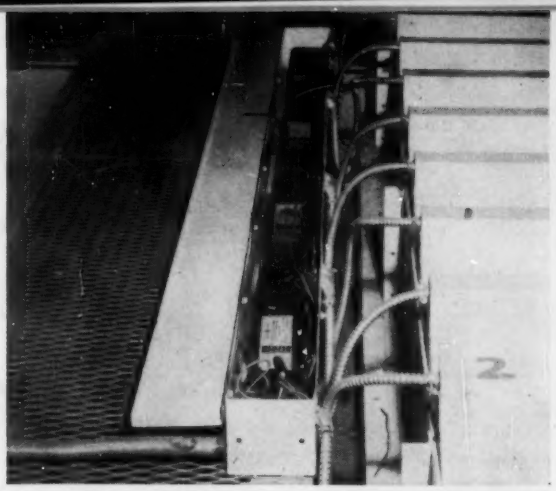
Special lighting effects were provided in some areas. For example, incandescent downlights in combination with fluorescent coves, bar, and wall lighting were used in the cocktail lounge. An island news stand uses a variety of display lighting effects. The main clock and posting board are lighted by means of 16 concealed 75-watt R-30 reflector spots from below, and 12 flush ceiling-mounted 150-watt R-40 flood lamps from above. The three entrance marquees use 300-watt recessed incandescent downlights for entrance lighting, and the windows above are floodlighted for architectural effect. Floodlighting is accomplished by means of three 500-watt totally-enclosed Crouse-Hinds floodlights per window, equipped with asymmetric lenses, and mounted in a trough in the marquee roof. To compensate to some extent for the sharp grazing angle of incidence, the windows are glazed with horizontally fluted diffusing glass. At the main entrance, interior draperies lined in white also contribute to the window reflectance.

The lighting result throughout is most gratifying. Contrast between luminaires and ceiling in the lobby and concourse is minimized by the high reflectances of the ceiling and of the floor, and the low brightness of the aluminum louvers. The floor is very light-colored terrazzo which redirects considerable light to the ceiling. Annoying reflections from the polished marble are practically absent and illumination on the murals is adequate. The murals became a part of the general lighting problem when the artist ruled out any form of special localized mural lighting. In the daytime, with cool white fluorescent lamps in the lighting units, the waiting concourse merges almost imperceptibly with the surrounding outdoor environment.

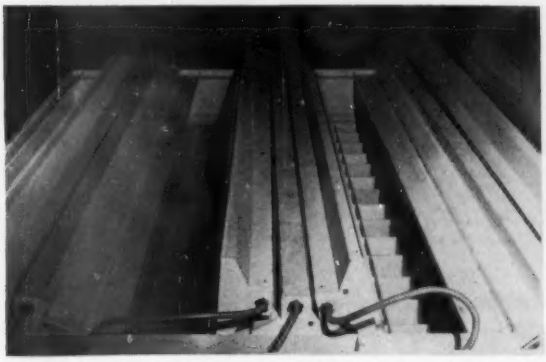
All lobby and concourse luminaires are arranged for relamping from an accessible attic, so designed to avoid setting up ladders or scaffolds in these



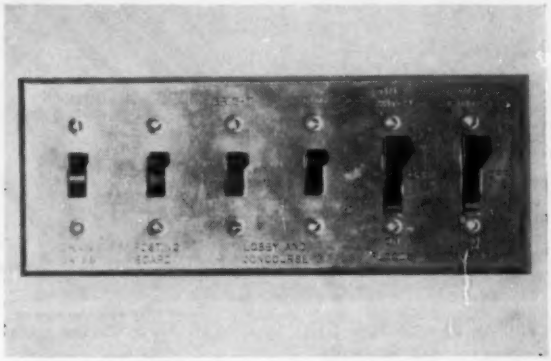
ATTIC VIEW of concourse 8-ft square luminaires, showing eight 1-lamp reflectors per unit, ballast housing, and catwalk for easy servicing.



BALLASTS for eight reflectors are installed remotely in 4-in x 4-in housing, to provide easy access and remove weight from reflectors.



REFLECTORS are hinged for easy cleaning. Note red jewel in end of reflectors for indicating when lamp is burned out.



CONTROL CENTER is simple six-switch panel, installed under main clock. It controls a total lighting load of 80.9 kw.

public areas. This arrangement permits the louvers to be permanently attached to the building structure. Each lamp is mounted in an individual reflector equipped with a continuous hinge on one side. To keep the reflectors as light as possible for maintenance purposes, all ballasts are separately mounted in a 4-in. by 4-in. wireway bolted to the building steel for better heat dissipation, and for accessibility from attic catwalks. A red jewel installed in the end of each reflector serves as an indicator of burned-out lamps for the maintenance men when in the attic.

Control of all lobby and concourse lighting in two levels of illumination is accomplished from a central control station by means of two single-pole double-throw wall switches, one for each level. These switches control mechanically-held magnetic contactors mounted within panelboard cabinets. The lamps in each luminaire are circuited to produce a symmetrical light pattern on the louvers, even at the low level when only two lamps per unit are on. In the low level circuit, half of the luminaires are on the emergency lighting system. This system alone may be used as a third and lower level of lighting. At the central control station are also installed a switch for control of soffit lights at train gates, one for control of posting board lights, and a hand-off-automatic switch for control of marquee downlights and floodlights either manually or through time switches, each acting through magnetic contactors. This miniature control center handles 80.9 kw of lighting load.

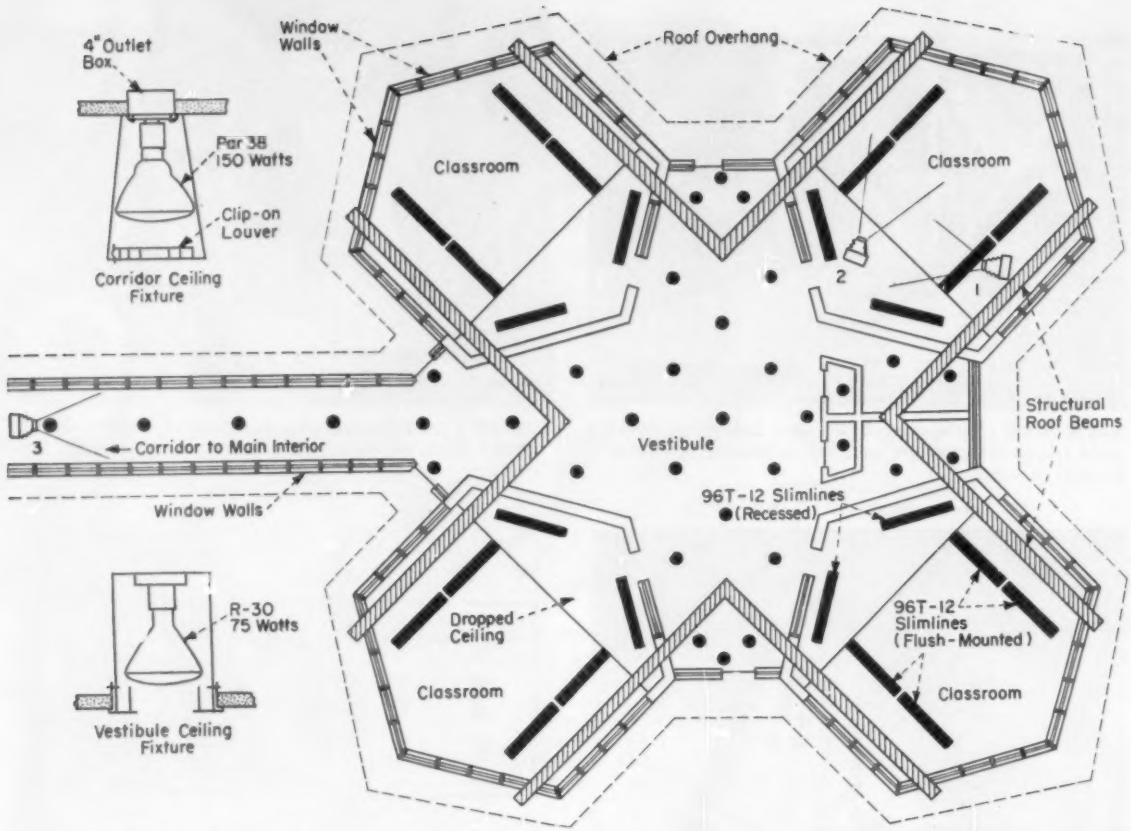
Sound System

The main objective in the design of the sound system was to obtain complete coverage of all passenger areas with low volume. A multiplicity of recessed DuKane speakers accomplished this purpose. High volume trumpets were used only outdoors in the train concourse.

Most speakers are 8-in. permanent-magnet type with individual volume adjustment, and the majority are mounted recessed in the ceiling with a concentric round louver diffusing grill.

The architectural treatment, the murals, the comfortable air conditioning and lighting, the soft-voiced, clear announcements all offer a startling contrast with the drab, uncomfortable, gloomy, noisy stations of the past. New Orleans' new Union Passenger Terminal, although small in comparison with those in larger cities, sets new standards for artistic and functional design, and for carefully planned light, sound, and thermal environments.

Architects for this project were (associated): Wogan and Bernard, Jules K. de la Vergne, and August Perez and Associates. Louis N. Goodman and Associates were the consulting electrical engineers, and A. R. Salzer, Jr. and Associates were the consulting mechanical engineers. Chris Larsen Company was the general contractor and Gibson and Odom, electrical contractors, installed the lighting and all electrical work. Solar Light Manufacturing Company of Chicago supplied the main custom-made lighting units.



TYPICAL CLASSROOM UNIT plan illustrates maximum use of fenestration. Numbered symbols show camera positions used for accompanying photographs.

TO PERMIT MAXIMUM USE OF NATURAL LIGHT

New Elementary School Selects

UNUSUAL architectural treatment of the new Heathcote Elementary School in Scarsdale, N. Y., which makes extensive use of glass areas demanded a lighting installation which would lend proper support to the natural light and yet stand on its own when the occasion demanded.

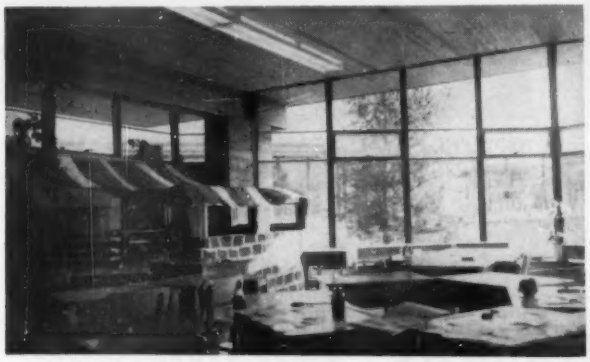
Classroom units at the end of glass-walled corridors extend spider-like in random directions from the single-story main building structure, which includes an auditorium, art, music and crafts rooms, a playroom, a library, school offices, and teachers' rooms.

Each of the 14 hexagonal-shaped classrooms receives natural light from four directions, two of the walls being entirely of glass. A roof overhang varying from 3 to 7 feet reduces sky brightness, while extensive grass and tree landscaping produces maximum eye comfort at the ground level. All chairs and tables in the classrooms are free to be moved about to permit accommodating the task being performed to the changes in natural light. To compensate for the drop-off in outside light toward the center of the classroom, two rows of fluorescent lighting fixtures, each consisting of two 8-ft troffers with two 96T12 slimline lamps, were surface-mounted on the ceiling, parallel with the walls having the least glass area. Additional 8-ft troffers were recessed into the lower ceiling above the yellow chalkboards and classroom doorways.

Classrooms of each group open upon a center vestibule in which are located clothes racks, closets, and washrooms. These vestibules are lighted by a liberal sprinkling of incandescent hi-hats housing 75-watt R-30 floodlamps, recessed into the dropped ceiling. All wiring to the ceiling fixtures is by flexible metallic conduit concealed in the ceiling.

A combination of plain and multi-colored glass lining the corridors leading from classrooms to the main school interior provides a bright and picturesque passageway for students going from one classroom to another. For periods of insufficient daylight, 150-watt PAR-38 reflector lamps in louvered cone-type fixtures were placed

1 **CHALKBOARDS** along interior wall are lighted by troffer recessed into dropped ceiling.



2 **ROOF OVERHANG** and landscaping cut down sky and ground brightness; 96T12 slimlines compensate for drop-off in outside light.

3 **GLASS WALLS** of corridors leading to classroom units allow liberal natural cross-lighting, supplemented by cone-type ceiling fixtures with 150-watt PAR-38 lamps.

Combined Lighting Design

on 10-ft centers on the corridor ceilings.

A 70 by 70 open court in the center of the building proper permits daylight to play an important part in the lighting of the rooms designed for special activities. The upper halves of two side walls of the 44 by 60-ft playroom are of glass. Artificial lighting supplements the natural light in the form of rectangular recessed incandescent ceiling fixtures containing 200-watt bulbs over wide-angle glass lenses. Three walls of the large library admit natural light. Circular fixtures recessed in the ceiling consist of a 30-inch diameter dome-shaped spun-aluminum reflector with baked egg-shell finish supporting a base-up 200-watt incandescent bulb shielded by a smaller satin-aluminum spinning with baked-on clear lacquer finish.

Art, music and crafts rooms, lighted artificially by 15-inch square recessed incandescent units with 200-watt lamps, polished aluminum reflectors, and wide-angle glass lenses, receive considerable natural light along interior walls by 4-ft square skylights fitted with opal glass.

Main service to school is 3-phase, 4-wire, 120/208-volt Y, carried by eight 500MCM conductors to a 1600-amp service switch and current transformer combination. Electrical installation was made by Port Chester Electrical Construction Corp., Port Chester, New York.

4 **LIBRARY** ceiling fixtures are recessed dome-shaped spun-aluminum reflectors over shielded 200-watt incandescent bulb.

DUAL PARKWAY in Boston is divided by 20-foot-wide tree-lined island, down the middle of which an underground feeder installation is run to serve single-arm lighting standards placed alternately along the island and outer curb lines.

NEOPRENE-JACKETED CABLE was placed 30 inches below ground in a single continuous operation, with a special plow cutting a temporary trench and a following truck equipped to supply cable as needed directly from jack-racked reels.

Practical Parkway Wiring

Modern methods for vulcanizing cable splices, placing cables underground with a special plow, and locating cable breaks through basic radio detection are revealed in this study of a highway lighting distribution system installed by the R. W. Jones Electrical Company of Sharon, Mass.

By Hugh P. Scott

ONE of Boston's attractive tree-lined dual roadways—the Veterans of Foreign Wars (or, for short, the VFW) Parkway—is illuminated by IES Type II luminaires mounted on single-arm ornamental standards which are staggered along outer curb lines and a continuous central island at approximate 100-foot intervals. With narrow asymmetric patterns of distribution, these luminaires produce fairly uniform light values on the roadway surfaces, provide a high order of object discernment, and have a minimum glare factor. That is, all of these desirable qualities are present when uninterrupted current is being carried by the direct-burial distribution system.

Until just recently, however, the system had not proved entirely infallible, for a combination of moisture, heat, fungus growth and lightning had been creating breaks in the cables with rising regularity. Locating these breaks has, as a result, become an increasingly costly nuisance, eventually prompting the City Fathers to approve a completely new distribution system. As low bidder for the project, the R. W. Jones Electrical Company of Sharon, Mass. was awarded the contract.

The fact that the new system is reliable is not surprising for the 5000-volt trench-laid cables are neoprene-jacketed, while all splices (at luminaire branch tap points in pole bases) are thoroughly vulcanized with insulation identical to that on the cables themselves. Furthermore, it was no coincidence that the Jones bid was reasonable, for the completed installation reveals several excellent time- and labor-saving practical methods that greatly reduced overhead without cutting into a fair profit.

Splices Vulcanized

Since unearthed sections of the old cables indicated that many of the shorts had been caused by damaged insulation at points where underground cables had been spliced to luminaire leads, considerable thought went into the

SPECIALLY DESIGNED PLOW consists of two side shields placed 4 inches apart and joined at the front by a rugged steel cutting edge. Sheave between shields provides path for cable as plow is hauled forward by tractor.

7-MAN CREW lays cable underground at rate of 5 feet a minute. Cable passes from truck-borne reel, over motor-straddling roller bar, to plow-contained sheave. Truck (here moved to left to permit better view) straddles trench.

development of a new method for completing this operation.

The result was the creation of a cast-aluminum vulcanizing block, consisting of two sections measuring 11 inches in width, 14 inches in length and 2 inches in thickness. Each of these sections is grooved in a wye pattern to receive the spliced cables, and each half is drilled to receive three 500-watt Chromalox cartridge heating elements. The upper half is also drilled to contain a sensitive thermostat bulb and, when in use, the two sections are held firmly together by means of a single centrally placed bolt.

The temperature of this vulcanizing block is regulated by a timer and relay. The thermostat-controlled relay cuts the current to the cartridge heating elements on and off in order to maintain constant, uniform heat in the blocks, and the timer shuts the current off completely after a definite, pre-established interval. Through repetitive trials and corrections, this temperature-time combination for satisfactory vulcanization was determined to be 300 degrees F for 25 minutes.

Current for this vulcanizing operation is provided by a trailer-mounted 5-kw Onan generator, and the timer and relay (together with a main switch, receptacle outlets for the six cartridge heater circuits, and a large pilot light) are mounted on a portable control panel which may be placed on the ground conveniently adjacent to the aluminum vulcanizing rig.

When making a connection, the cables are first spliced by means of compression sleeves. Then the wye-shaped junction is thickly wrapped with strips of crude neoprene and placed in the groove of the bottom aluminum block. Next, the upper section of the assembly is securely bolted into position, the unit is placed on an asbestos base pad, and the current to the heating elements is switched on.

During the following 25-minute interval when the neoprene is "cooking", the splice-maker can move along to the next lighting standard and can start on a new splice. From time to time he glances back towards the large pilot light atop the control panel and, when the light finally remains off, he knows that the vulcanizing period has been completed. He then can return to his former station and finish the routine of unbolting the aluminum sections from around the cables, tucking the vulcanized splice into the base of the luminaire standard, lifting the block and control panel into the generator truck, and driving the equipment to the next station where the complete routine is repeated.

This procedure results in positive insulation, for the neoprene insures a continuous, uniform, homogeneous, protective covering over the splice. And the procedure also saves considerable time, cutting the former manual tape-winding cycle by about a third.

In this instance, the crude neoprene was supplied in large sheets by Simplex, the manufacturer of the cable. Then, after they had been received in the Jones warehouse, these sheets were sliced into ribbons and the ribbons were separately wrapped in foil to keep them from sticking together. This procedure facilitated convenient handling, storage, transportation and ultimate application.

Cables Plowed Underground

Although the lights along the VFW Parkway are staggered (with alternate standards placed along outer curb lines and the central island that separates the two one-direction roadways), the main electrical feeder line for the installation is run underground only beneath the 20-foot-wide island. This line weaves gradually from one side of the island to the other, rising into the bases of all island-located luminaire standards so that splices to these fixtures can be made in these readily reached and easily inspected positions. To serve lighting fixtures along the outer curb lines, branch taps are carried outwards from the main feeder line, passing beneath the surface of the 30-foot-wide roadways, then rising into the pole bases in the same manner as just noted.

In some instances, cables were in-

TRAILER-MOUNTED GENERATOR supplies current required to operate electric heating elements embedded in cast-aluminum vulcanizing block. Homogeneous insulation over splice is obtained by keeping vulcanizing block at 300-degree temperature for 25 minutes.

ALUMINUM VULCANIZING BLOCK is grooved to receive wye-shaped cable splice and is drilled to receive six 500-watt cartridge heating elements and one thermostat bulb. Temperature of block is regulated by timer and relay mounted on portable control board.

stalled beneath traffic lanes by means of trenching-backfill-resurfacing procedures. In other instances the cables were carried in conduits driven beneath the roadways by hydraulic ram. Laying of the main feeder line, however, was performed as a single operation, with a 7-man crew operating a tractor, hydraulic plow and reel-carrying truck as an integrated unit.

The key item of equipment in this combination is the plow, designed and constructed by Jones specifically for this cable-laying operation. The plow head (raised or lowered by hydraulic booms) incorporates twin shields fabricated from 10-gauge steel, each shield measuring approximately 40 inches in length and 30 inches in depth. These shields come together along an inclined line to form a narrow V, and this forward junction is surmounted by a sharpened ¾-inch reinforced steel cutting edge. The shields at the rear and base are spread 4 inches apart, and in this space a sheave is located to receive the 5000-volt neoprene-jacketed cable which is being placed underground.

This plow is given direction and force by the hydraulic boom plungers which, in turn, are mounted on and operated from a rubber-tired chassis hauled along by an I-H tractor. When the plow is at its lowest position, the bottom of the cable sheave is 30 inches below grade. It was at this elevation that the cables were placed.

During the actual cable-laying operations, the tractor-plow assembly is followed by a truck equipped with jack-racks that hold cable reels, and a rolling bar support above the engine to support the cable as it is unreeled. Since this cable drops down between the twin shields of the plow and passes over the sheave, it is readily apparent how a trench can be momentarily opened and the cable laid at the bottom of this trench in a single, continuous operation. As the plow moves forward the earth tumbles back into its initial position, thereby eliminating the usual backfilling procedure, and all that remains to finish the job is to lightly roll the surface.

Of the seven men engaged in this operation, one drives the tractor, another drives the truck, a third operates the plow and the fourth attends the cable being unreeled. The fifth guides the cable between the plow shields and over the underground sheave, while the remaining two men handle the cable between the truck and plow head.

With this set-up of equipment and manpower, cable could be laid at the rate of 5 or 6 feet a minute and, including the installation of splices at pole locations, the distribution system for the Parkway went in at the rate of half a mile per day.

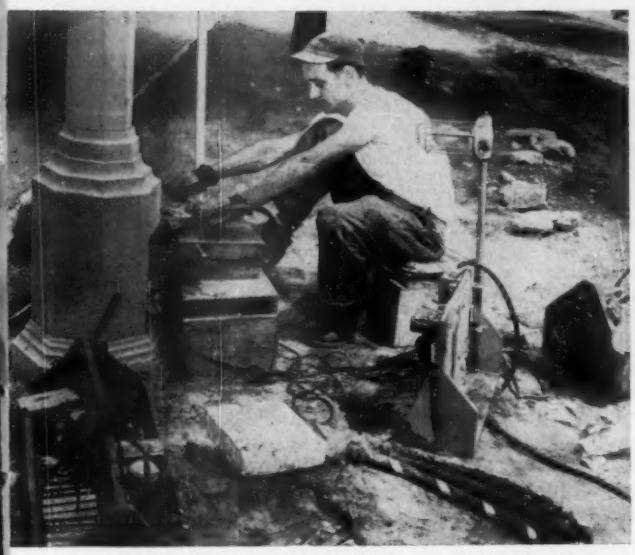
This was the general procedure followed although, in a few instances, it was necessary to widen, deepen or open the trench for special operations. This was accomplished by using a trenching scoop mounted on the front end of the tractor, a trencher that could go down 9 feet where necessary.

Radio Detection Locates Breaks

As previously mentioned, this new distribution system was deemed necessary because of the frequent recurrence of breaks in the old feeder installation, even although the location of breaks had been greatly facilitated by radio detection.

The detection method, likewise developed by R. W. Jones, was simple both in theory and operation, for the motor of a truck was used to initiate a signal pattern, the signal being transmitted within a limited range by the buried cable. A portable radio equipped with earphones was the means of detection.

To transfer the pulsations of the truck motor to the buried cable, alligator clips on opposite ends of a connection lead were clipped respectively to one of the motor sparkplugs and to a sharpened prod which was driven through the insulation of the shorted buried cable. The prod was placed at the splice point in the base of a luminaire. Then with the motor running, the click-click-click of the sparking plug could readily be detected at all points along the unbroken cable. This transmitted clicking, however, ceased at the point of a break so, by walking slowly along the route of the under-



SECTIONS OF VULCANIZING RIG are held together firmly by a single centrally placed bolt. Pilot light on control board remains lit until timer interrupts current passing to embedded heating elements. Splices are vulcanized with strips of crude neoprene.

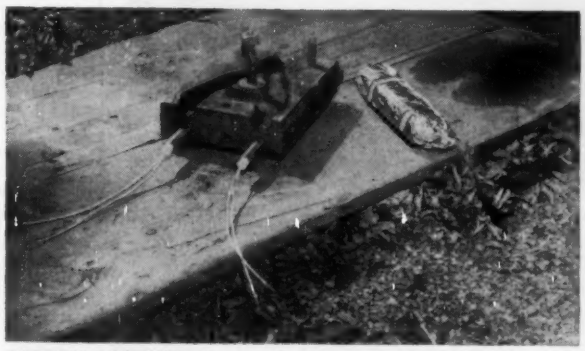
INSULATED SPLICE is tucked into base of light standard after completion. Standards are staggered along dual roadway at approximate hundred-foot intervals, supporting IES Type II luminaires which provide fairly uniform asymmetric lighting for Parkway.

ground feeder line, a man carrying the small radio and wearing the headset could spot the exact point of the break within a few inches.

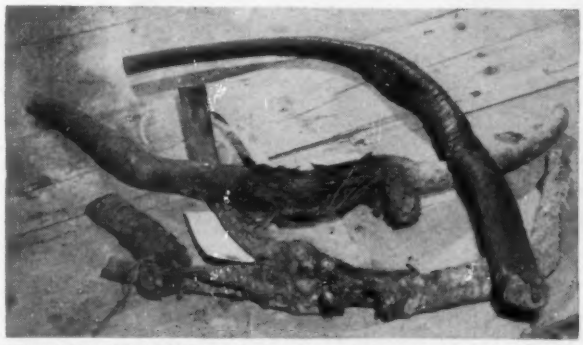
This, of course, greatly simplified the location of breaks, for only one hole had to be dug to reach the short, and exploratory trenching was completely eliminated.

A subsequent refinement to this method placed a coding device on the truck's engine block, so that the steady click-click-click of the motor was converted into a more distinctive dash-dot-dot-dot. This minor change in the signal made it possible for a man to quickly identify it, even within the city limits where high-decibel traffic noises are most frequent. By thus speeding detection and eliminating fruitless digging, the cost required to locate and repair a break was eventually reduced by 80%.

These methods—all of them practical, basically simple and made possible through the use of equipment designed and constructed in the Jones shop—illustrate the fact that contracts can be won by sharp thinking and job analysis as well as by sharp figuring and profit-cutting. And these methods also resulted in shortened installation time, conservation of effort, a more reliable distribution system, approval and recognition by city engineers and inspectors, plus considerable reflected credit for the contractor in good-will and personal prestige.



BOTTOM SECTION of cast aluminum vulcanizing block shows wye-shaped groove to receive spliced cable, drilled holes for cartridge heating elements, guide pins and holding bolt. Foil-wrapped package of crude neoprene is at right.



DAMAGED SECTIONS of former installation had to be located, unearthed and repaired frequently, resulting in disproportionate maintenance charges, even although location of breaks was eventually simplified by radio detection.

Armature Testing

By Walter J. Prise,
Chief Engineer,
Queens Electric Motor Co.
Jamaica, N. Y.

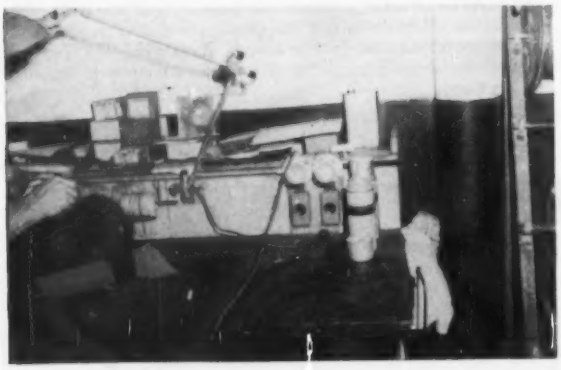
All tests on motors can be divided into two basic groups:

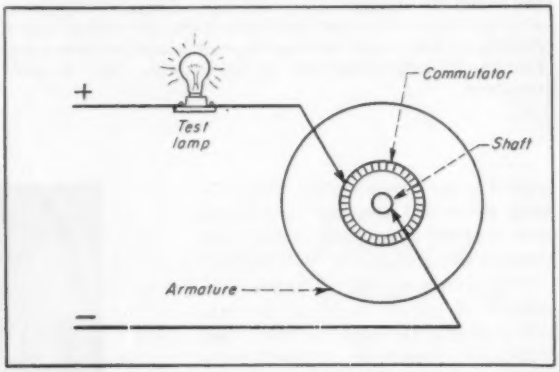
1. Tests which are made in the shop after completion of a repair job.
2. Tests which are made as part of a troubleshooting procedure to determine the cause of faulty motor operation.

Shop tests are made primarily to check the accuracy and quality of repair work, to assure proper and trouble-free operation of the machine after it leaves the shop. Tests are also made in the field to determine the nature of trouble or faulty operation and to facilitate repair of defects when found.

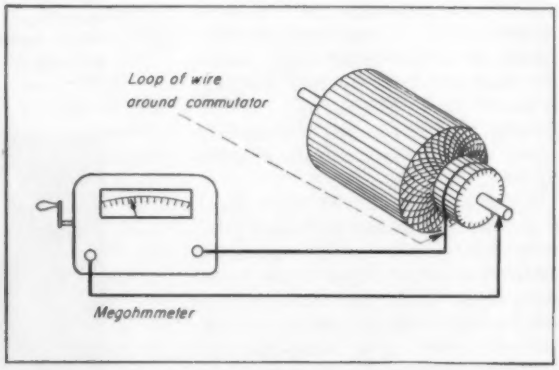
Shop tests may be divided into two types—indicative and localizing. Indicative tests are made to determine if particular defects exist in a machine; no attempt is made to locate the defect exactly. Indicative tests are, in general, less complicated than localizing tests and are easier to make. Often, however, the two types of tests are part of a single testing procedure. Localizing tests are used to find the exact location of a fault and to indicate the corrective measures which should be taken.

The following tests are of the indicative type and cover typical armature defects. All armatures leaving the shop must be free of defects. They must be wound in accordance with specifications and tested for grounds, opens and shorts.

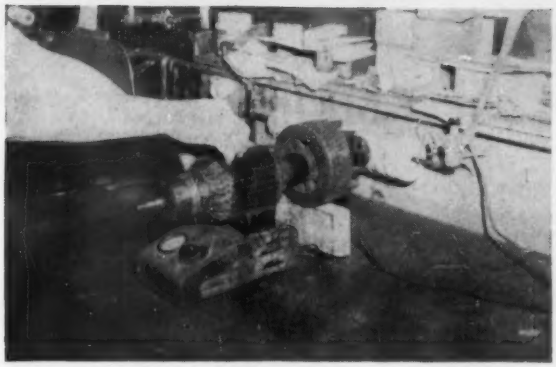


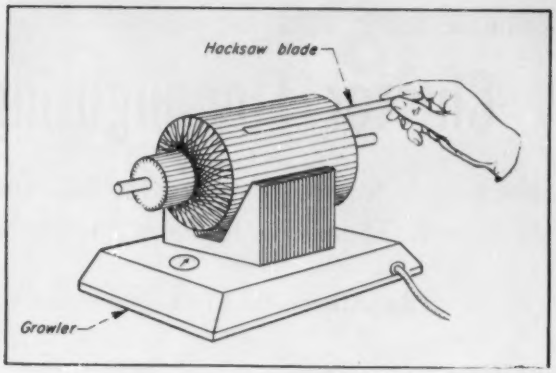


STEP 1.
Testing for ground faults with a test lamp. Place one probe on the armature shaft (ground) and touch the other probe to the commutator bars, which are connected to the armature coils. If there is no ground, the lamp will not light. If the armature winding is grounded, the lamp will light to indicate contact between armature coils and the body of the armature. This test will not indicate high resistance grounds. In this test, the armature should be rotated to contact all of the commutator bars.



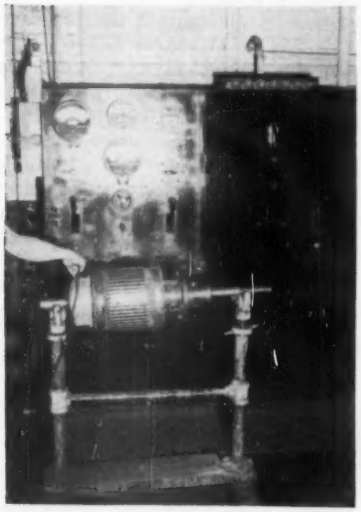
STEP 2.
Testing for ground faults with a megohmmeter. In this test, the commutator bars are tied together by a piece of soft wire around the commutator, as shown. One probe from the megohmmeter is then connected to the end of the loop of wire on the commutator. The other instrument lead is attached to the shaft of the armature. Because of the relatively high voltage developed by the megohmmeter in this test, care should be taken to avoid injury due to current flow through the human body. A low reading on the megohmmeter indicates ground fault in the armature. The minimum acceptable resistance value is 1 megohm; however, higher values of resistance indicate better insulation conditions and are more desirable.

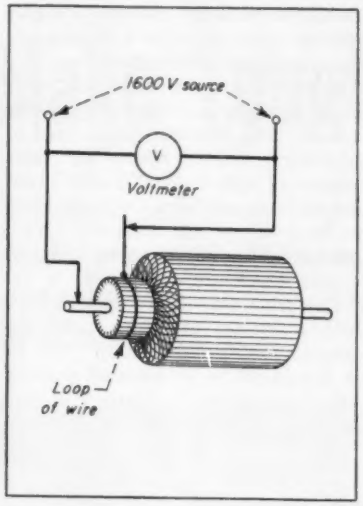




STEP 3.

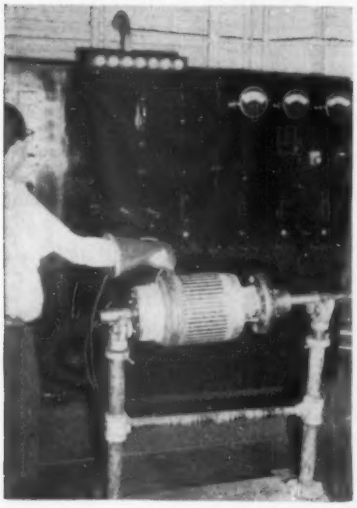
Growler testing for shorts in the armature. In this test, the armature is placed on the growler, and the growler energized. The armature is then rotated on the growler. When a shorted section is rotated into the cradle of the growler, much higher current will pass through the growler winding, causing noticeable deflection of the meter needle. The presence of a short may also be indicated by noise. An old hacksaw blade may be used as shown to indicate the position of the damaged coil. When moved around the circumference of the armature, the hacksaw blade will be attracted to the damaged coil.

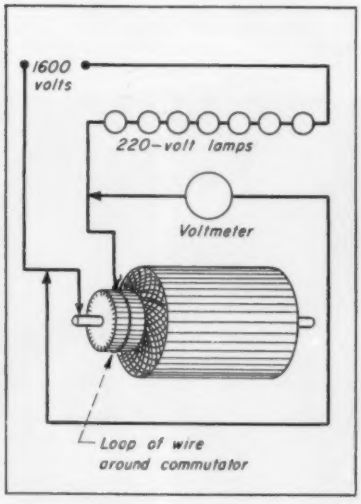




STEP 4.

High-potential testing of armatures. Rebuilding standards of the National Industrial Service Association require that dielectric tests be made on all rebuilt equipment as follows: 1. For equipment rated 600 volts and below, a 60 cycle ac voltage of twice the unit's rating should be applied for 60 seconds between all windings and all current carrying parts and the frame. 2. For equipment rated between 600 and 2200 volts, a 60 cycle ac voltage of 1½ times rated voltage of the unit should be applied for 60 seconds between all windings and all current carrying parts and the frame. New equipment, new windings and newly rewound equipment or coils in which copper has been completely reinsulated should be tested at double voltage plus 1000 volts for 1 minute. The diagram shows connections of the voltmeter and probes.





STEP 5.

High-voltage testing with lamps in series with the circuit. Tests can be made more illustrative by placing a number of incandescent lamps in series in the circuit. In this test, the voltmeter is used as in the previous test, but 220-volt lamps are connected in series. Full brilliance of the lamps when connected directly across the line indicates approximately 1600 volts, which is 600 volts (rated voltage in most cases) plus 1000 volts.

Northland Center Uses

Cluster Floodlighting For Parking Areas

Special pole-top rings support ten 400-watt mercury vapor floodlights, and twin-unit yokes with Thompson hangers facilitate maintenance at shopping center.

By Albert B. Blixt, Vice President, F. J. O'Toole Company, Detroit, Mich.

CLUSTER floodlighting, rather than conventional street lighting units, was the answer to a rather tricky problem of adequately lighting eight irregular-shaped parking areas surrounding a 70-store hub at J. L. Hudson Company's Northland Center shopping district in suburban Detroit. Victor Gruen Associates, architects for the 161-acre shopping facility, designed each area to fit the parking needs of the commercial section upon which it borders. The eight areas combine a 6,000-car capacity with more than an adequate system of entrances, traffic lanes and exits to permit customers to arrive, park and leave the Center quickly and easily.

The ultimate goal was to provide good center and edge illumination in each "lot" with a minimum number of poles or light standards. Following design specifications to achieve this result, F. J. O'Toole Company, project electrical contractor, installed a total of 310 Crouse-Hinds, 18-in., MUA floodlights (400-watt mercury-vapor, non-color-corrected lamps) on 31 60-ft metal poles spaced approximately 300 feet apart.

Location and number of poles varied with the size and shape of each parking area. Because of this, floodlights with their high penetrative power were selected as the lighting method. The combination of mercury vapor lamps and floodlight housings provide a highly efficient illumination level of from one to 1½ footcandles throughout the areas. The mercury vapor lamps add operating economy and durability to the system. The 400-watt lamps used at Northland deliver nearly the same amount of light as a 1,000-watt incandescent lamp and burn five to six times as long. These are decidedly advantageous characteristics when long operating hours are considered.

One triangular-shaped parking area with a 604-car capacity typifies the general floodlighting pattern. The lot is illuminated by 30 400-watt mercury vapor floodlights, in clusters of ten, on three poles. Of the ten units per pole, five are designed to project a narrow beam and five a wide beam.

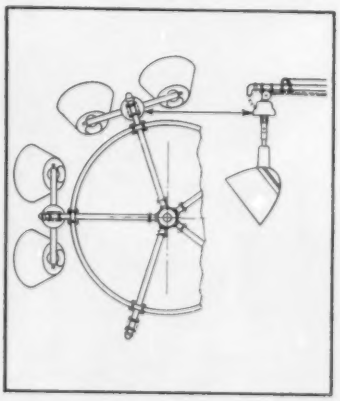
A pipe ring assembly at the top of each 60-ft pole supports the cluster of ten floodlights. The 4½-ft diameter ring is formed from standard 1¼-in. pipe. Five spokes or supporting "arms" of standard 1½-in. pipe radiate from the pole top. At the outer end of each 3-ft long arm is the stationary socket of a Thompson hanger. The drop-out section of each hanger is mounted to a metal yoke which supports two floodlight units.

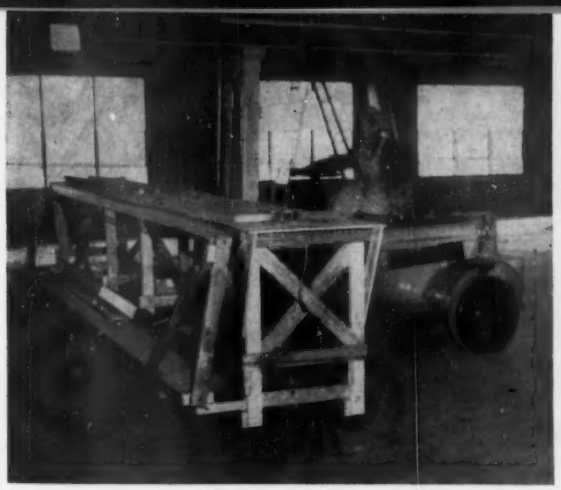
The ballast and fuse cutout for each floodlight are mounted in a watertight enclosure at the pole base. An additional terminal panel and step-down transformer in the enclosure provides 120-volt power for miscellaneous loads. Underground circuits provide 480 volts to the primary of each ballast. Secondary voltage to the mercury lamps is in the 163-volt range.

An electric timer and photo electric cell provide complete control of the parking area floodlighting system.

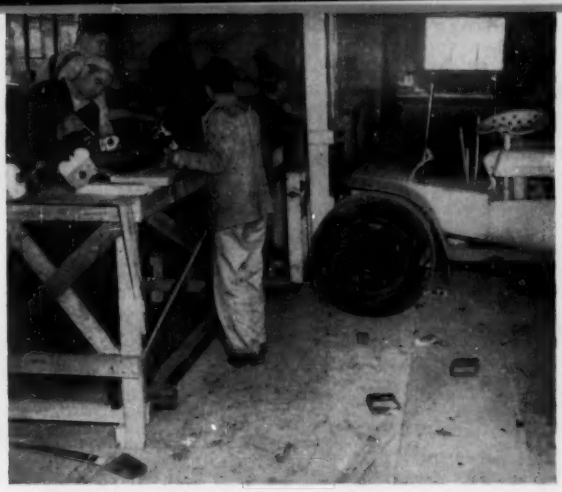
POLE-TOP CLUSTERS of ten 400-watt mercury vapor floodlights per 60-foot pole permit large area parking lot illumination with a minimum number of light standards. Twin-unit yokes on Thompson hangers permit ground level servicing of lights. Narrow and wide beam floodlights illuminate center and edges of parking area with an average of one to 1½ footcandles. Photo cell turns all units on at dusk. Timer turns 8 of 10 lights per pole off at closing time. Others remain on for protective lighting.

SPECIAL RING ASSEMBLY supports five twin-lamp yokes, each equipped with a Thompson hanger. The 4½-foot diameter ring of 1¼-in. standard pipe is U-clamped to five 3-ft long arms of 1½-inch pipe. Lamp ballasts and cutouts are mounted in pole-base enclosure.





STURDY ASSEMBLY BENCH provides sufficient space for connecting five 4-foot lighting fixtures end-to-end. One side of bench is equipped with plank walk-way, with guard rope extending along outer edge as safety measure.

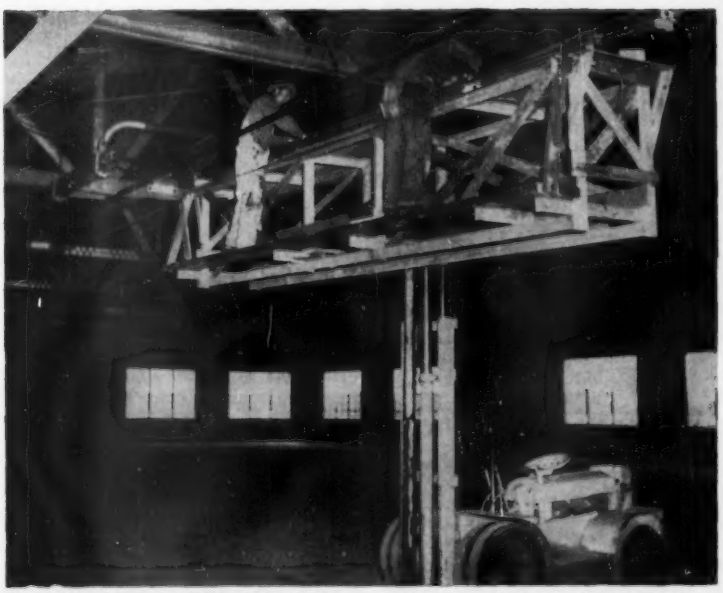


WHILE ON THE FLOOR, the bench can be approached on either side, so that initial connection and wiring of fixtures may be speeded through the employment of several men during this period. Bench is secured to truck fork to prevent tipping.

Power Tooling and Methods Planning

Make Tough Jobs Easy

Contracting engineers Bob Schwartz and Steve Lindheim of Oakland, California, make tough jobs seem easy by planning methods to speed and simplify installations. Here are some of their ideas for mounting bus duct, suspending lighting fixtures and erecting switchgear in a new laboratory.



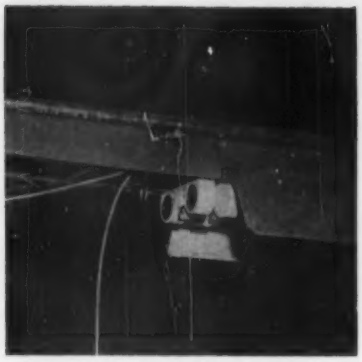
WHEN LIFTED TO TRUSS HEIGHT, the assembly bench supports fixtures or busduct sections at the exact elevation desired. Bench also supports all tools and wiring accessories within easy reach. Walk-way permits movement of workers.

TWO RELATIVE youngsters in Oakland, Calif., are rapidly gaining a reputation in their own back yard for making tough jobs easy and for cutting installation time by planning jobs down to the smallest detail. Electrical contracting-engineers Bob Schwartz and Steve Lindheim take full advantage of power tools, apply basic know-how to develop cost-saving variations in design—and constantly think up new practical methods for performing standard jobs.

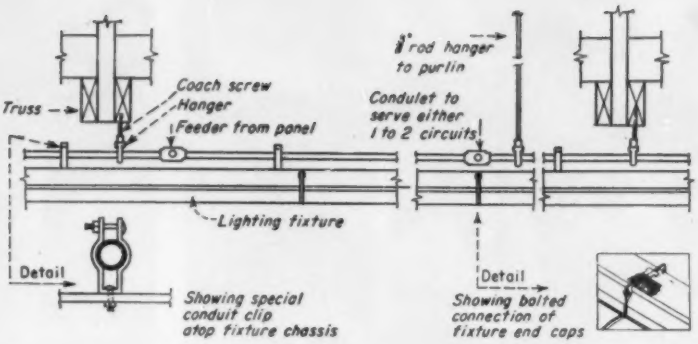
At a recent project of theirs in Mountain View, Calif., they designed and installed a lighting and busduct installation for a 40,000 square foot electronics laboratory, production plant and office for Sylvania Electric Products.

Elevating Work Bench

There, to facilitate the installation of lighting fixtures and busducts, they designed an assembly bench which could be raised vertically to truss level by means of a hydraulic-gasoline



OPEN-END INDUSTRIAL FIXTURES are connected to one another by means of bushings and bolts attached to end caps. Fixture chassis are attached to branch conduits by means of face-to-face strap clips, also bolted. Actual connection and splicing operation is thereby steamlined.



CIRCUIT WIRING is carried within rigid conduits secured to trusses by coach screws and to purlins by rod hangers. Circuit connections to blocks of fixtures are made through condulets, with fixture-to-fixture wiring carried in luminaire chassis. Fixtures are suspended from conduits by special clips and bolts. Clips are formed from spring steel to permit fast snap-on positioning, then are secured by round-head bolts. Since branch circuit wiring is pulled through conduits to condulet outlets before fixtures are raised into position, installation is fast.

fork-lift truck. This work bench had a length of approximately 20 feet and a width of 30 inches, thereby providing sufficient bench-top space to assemble and connect five 4-ft. lighting fixtures together as a single continuous coordinate. The bench also had a height of approximately 3 feet so that, while it rested on the floor, men could stand on either side of it and work at a convenient arm level, with minimum fatigue. Wiring and assembling fixtures as 5-unit components in this manner promoted accuracy of alignment, while performing this work at floor level insured safety, reduced the mechanics of delivering materials and parts to working points as required, and correspondingly cut the time required for this assembly procedure.

After several 5-unit assemblies were ready for mounting, the bench (with two men standing on a narrow plank walk-way extending along one side of the bench) was raised by the fork truck until fixtures were at their intended elevation. It was then a simple matter for the men to make final connections and splices, for they had relative freedom of movement, they could move back and forth along their plank walk-way, they were not required to lift or hold fixtures in place during the connecting or splicing operations, and all required tools and wiring accessories were within easy reach on the top of the elevated bench.

Both the bench and walk-way were ruggedly constructed, formed from 2-inch. stock, liberally braced and bolted. Safety for the men working in the elevated position was also improved by the placement of a guard rope along the outer edge of the platform. And, to make sure that the bench did not tip or topple while being lifted or held aloft, the bench was securely clamped to the fork of the truck, and the truck selected had sufficient weight to more than balance the combined weights of the bench and the two workmen riding with it.

The lighting fixtures so assembled and installed (756 in all) were 2-lamp 40-watt Sylvania open-end industrial units equipped with turret-type lampholders on 3½-in. centers, an arrangement that provided a transverse light cutoff of 13 degrees. Since fixture chassis had no cross bracing except their knockout-pierced end caps, circuit wiring could be drawn through the luminaires with minimum effort. And end caps of adjacent fixtures were fastened together by means of bushings and bolts, an arrangement that brought open ends of the reflectors to within ¼-in. of one another, resulting in practically continuous lines of unbroken luminosity. In all, eight continuous rows of these 2-lamp fixtures were installed, each row extending 350 feet overall. Lighting intensities obtained by the installation averaged 50 footcandles at normal working elevations.

Clips Speed Fixture Suspension

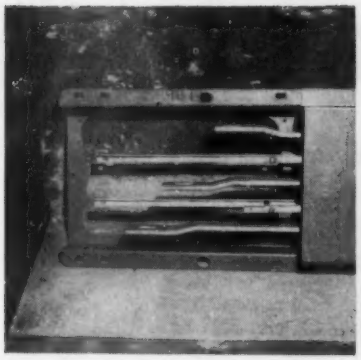
A second practical method used on this job also relates to the suspension of fixtures for, after the 5-unit luminaire assemblies were raised into position by the elevating work bench, they were quickly and easily attached to ¾-in. branch conduits by means of spring-steel clips and bolts. Since these clips (in appearance looking like two conduit straps placed face to face) had previously been secured to the tops of fixture chassis, final mounting merely consisted of forcing the split clips around conduits, then bolting the clip ends together. Moreover, since branch circuit wiring had previously been pulled through these supporting conduits from related control panelboards to various condulet tees, actual splicing of fixture wiring was a fast, simplified operation.

Suspension of branch conduits was by means of coach screws and loop hangers whenever conduits passed beneath beams of the sturdy roof trusses, while intermediate points along the conduits were supported by ⅜-in. rod hangers extending down from purlins.

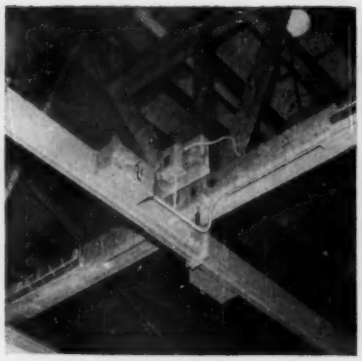
Aluminum Plug-in Busduct

A third mention-meriting feature of this installation is a plug-in busduct system, consisting of approximately 600 feet of aluminum bus sections arranged as three 200-ft sections mounted at truss level above the production area. This installation (one of the largest concentrations of aluminum bus on the west coast to date) was installed in the same basic manner as the lighting fixtures, with standard 10-ft duct assemblies lifted into position by means of the fork-hoisted elevating bench, then secured in position by the two bench-riding workers. Actual suspension of ducts was by means of 2-piece clamp hangers, with hanger-incorporated turnbuckles permitting adjustment for exact elevation.

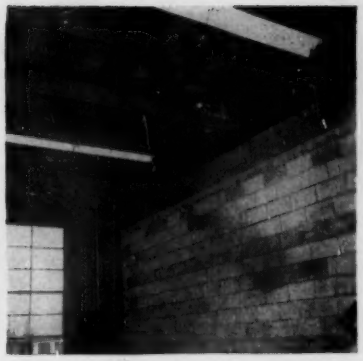
By selecting aluminum as their main current-carrying medium, contracting engineers Schwartz and Lindheim obtained a 30% decrease in duct weight —a reduction that lessened loadings on trusses, decreased manual effort related to handling and, resultingly, contributed to faster installation times.



ALUMINUM BUS BARS are zinc coated to preclude corrosion, while all contact surfaces are silver plated to provide non-electrolytic connections between buses and copper clamping devices. Use of aluminum busduct cut overall weight of system by 30%.



BUSDUCT SECTIONS were secured by means of 2-piece clamp hangers, then leveled with the aid of turnbuckles. Power taps for motors or lighting panelboards were effected through vacu-break plug-in devices. Busduct and lighting fixtures were mounted below trusses.



PANELBOARD FOR LIGHTING CONTROL is wall-mounted, with feeder dropping from vacu-break plug-in busduct section, and branch circuits extending up and across ceiling to various fixture rows. Wide wiring gutters were standard procedure.

To minimize corrosion, aluminum busbars are zinc coated and, to obtain positive non-electrolytic contacts between aluminum and copper segments of the distribution system, all bus contacts are silver plated.

Power for these busduct sections is obtained via cables in rigid conduit from the main switchboard, while power for the lighting system is carried through duct-plugged vacu-break switches, down to wall-mounted panelboards, then back up to truss level as separate branch circuits extending to various blocks of fixtures in each of the eight continuous rows.

Louvers Reduce Switchgear Heat

Of final interest on this job is the design of the main switchboard, for a 2000-amp switch is used in place of a main breaker, and the switching cubicle features a multi-louvered top and bottom trim. This combination of variations minimized space requirements, permitted greater air circulation with a corresponding lessening of heat within the switching enclosure, and also reduced the cost of the switching unit as a whole.

Since the switchgear assembly is located against an exterior structural wall (on the other side of which is located the outdoor substation), connections from transformer secondaries to switchgear bus structure is only a matter of a few feet, consisting merely of short flexible feeder leads clamped to buses in a weatherproofed service hood and entrance port. Transformers, incidentally, are 12-kv — 120/208-volt 3-phase 4-wire units.

At no time during the entire period of installation did Schwartz and Lindheim have more than eight men on the job, yet due to practical methods such as those here discussed, the 756 lighting fixtures were installed in five days and the 600 feet of busduct were installed in three. Other segments of the overall electrical installation also went in with eyebrow-raising rapidity, again attesting to the solid values obtainable through careful job planning, close scheduling of material deliveries, extensive use of modern tools and methods, plus the addition of that most essential of all ingredients—ingenuity.

This installation is indicative that brains can replace brawn, and planning can eliminate problems encountered during the actual installation period, for this quickly-installed, apparently-simple job was actually the result of careful analysis plus considerable imagination and attention to details prior to the actual installation.

SWITCHGEAR ASSEMBLY incorporates Pringle switch instead of main breaker as a space- and cost-saving expedient, while cabinet is louvered top and bottom to promote ventilation and reduce trapped heat within the enclosure. Main switchgear initially serves three aluminum plug-in busduct runs, from which power take-offs extend to all motors and lighting installations in the plant. Capacity of system provides for future expansion.

OUTDOOR SUBSTATION is pad-mounted close to structural wall, on the other side of which the plant's main switchboard is erected. Therefore connections from transformer secondaries to service entrance bus structure are short, while connections from entrance bus to switchgear are only a matter of a few feet. Power is delivered to transformers at 12-kv, being stepped down to 120/208 volts for utilization.

MASSIVE HANGAR DOOR is composed of seven 20- by 36-ft panels weighing six tons each. Two- and three-pole trolley ducts feed master control circuit and 3-phase power to the drive motors inside each section. Local control is provided by pushbuttons mounted flush in either end of each panel.

CONTROL WIRING FOR . . .

6-Ton Motorized Doors

Flexible and accident-proof control system for 140-ft wide hangar doors at Grumman Aircraft Plant in Calverton, N. Y. uses standard electrical components throughout.

MOTOR-OPERATED doors are an important feature of the industrial plant designed for efficient operation. They facilitate movement of large apparatus and bulky lots of material, and reduce job time and fatigue.

Although widespread use of these units is fairly recent, their design has been improved rapidly to meet the urgent needs of such heavy equipment handlers as the aircraft industry.

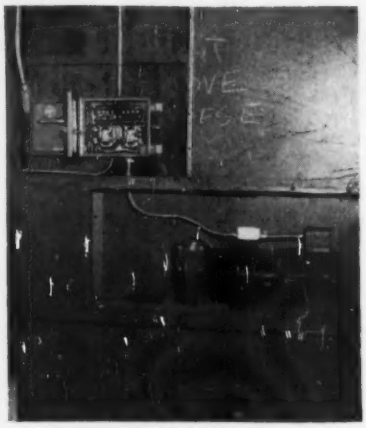
The 140- by 36-ft doors of the new Grumman Aircraft Plant in Calverton, N. Y. are made up of seven overlapping sections mounted on separate tracks. Each of these panels, which weigh six tons apiece, is powered by a 3-phase, ¾-hp motor, mounted within the door, which operates the chain drive mechanism through a 30-to-1 gear reduction box.

Each section of the door is independently operable to afford quick and easy passage of small apparatus and trucks. This minimizes loss of conditioned air from within during these recurrent openings. Local control is obtained by two-contact pushbuttons mounted on either end of each of the seven panels. These parallel-connected stations actuate a reversing starter adjacent to the motor on the individual door section.

Safety Provisions

All pushbuttons are of the momentary-contact type and holding contacts are omitted from the magnetic contactors so that the doors will be in motion only while a button is depressed.

POWER AND CONTROL TROLLEYS are chained to an angle iron bracket on door to relieve strain on rubber cord jumpers. Limit switches (arrow) trip as end of track is approached, opening control circuit.



THREE-PHASE MOTOR, rated at ¾ hp, operates chain drive through 30:1 gear reduction box. Magnetic brake on right end of motor stops door instantly when circuit is opened. Disconnect switch and reversing starter are shown at left.

To prevent the doors from coasting, a magnetic brake is coupled to the motor shaft. The brake, which is connected in parallel with the motor, becomes engaged at the instant the power circuit is de-energized. Limit switches on both ends of each door section open the control circuit as the panel reaches either terminal point to avoid the possibility of the panel running off its track.

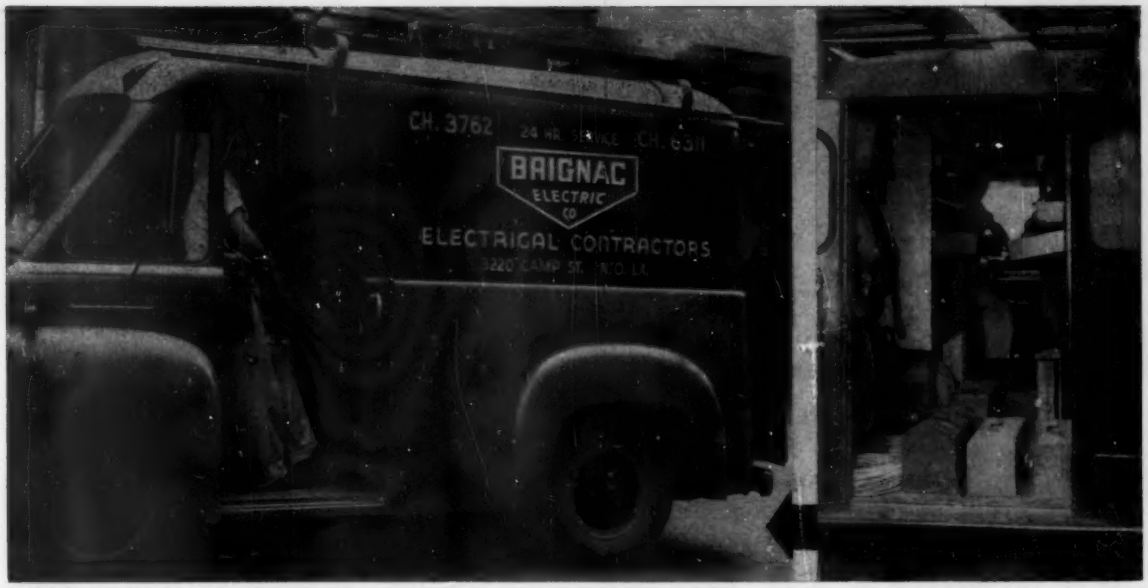
Short circuits, which would occur if both forward and reverse contactors were closed at once, are averted by connecting each control circuit in series with a fourth normally closed pole on the opposing contactor.

Operating time for opening the entire 140-ft door is reduced by the provision of a master control system. Hub of this system consists of two 7-pole magnetic contactors actuated by a master "open" and a master "close" pushbutton. Each pole of the "open" contactor feeds one side of the seven (one for each door panel) 2-pole *control* trolley ducts. The other duct conductor is fed by the "closed" contactor.

These seven *control* trolley ducts, along with seven 3-pole *power feeder* trolley ways, run parallel and just inside the top tracks for the individual door sections.

This installation is of particular interest because it includes so many control features which might be needed in a power-operated door, without resorting to custom-built components.

Broadway Maintenance Corp. and C. A. Mulligan handled the job.



SHOP-ON-WHEELS is this fully stocked truck which patrols the small-job modernization market in the New Orleans area.

Lighting Circuits at "La Louisiane"

One stop in the daily rounds of a mobile modernization team covering the small-job rewiring market in New Orleans, Louisiana.

By Frank Prattini, *Manager, Brignac Electric Co., New Orleans, La.*

MOBILITY of operations is the method by which Brignac Electric Co., New Orleans, La., is capitalizing on the size of the electrical modernization market. An electrical shop-on-wheels—a "milkman" type truck, well-stocked with supplies and equipment for any average size job—is the key to this mobile operation. The pattern of operation of this truck and its two electricians—hit a job, finish it, move on to the next—adds up to more efficient, effective work which results in lower job costs with consequent advantages. The accompanying series of photos shows how this mobile team moves in and handles a typical modernization job.

After finishing up a fluorescent lighting job in a downtown New Orleans tavern, Charley Niemeyer Jr. and Les Gauthreaux, the mobile team, threw their gear in the truck, jumped in and headed for "Diamond Jim" Moran's famous restaurant, "La Louisiane", in the old French Quarter. The interior of this restaurant was being remodeled in stages to avoid interruption of regular business and electrical work was part of the job.

Some time before, Charley and Les had put in steplight circuits and ceiling circuits in one of the several dining areas. In this dining area, they installed three No. 12s in ½-in. EMT, from a lighting panel, feeding seven duplex receptacles spaced along top of wall on one side of the area. Seven canvas panels, painted to simulate clouds in a night sky, are suspended across the area, between beams, forming a false ceiling. For each panel, a 50-watt, 110/16-volt transformer, mounted up near and plugged into one of the receptacles, feeds 20 16-volt lamps which protrude down through the canvas on random spacing. Each lamp socket in the No. 18 T wire circuit is equipped with a flasher. Overall effect of flashing lamps is that of twinkling stars in sky. Other lighting complements this ceiling layout.

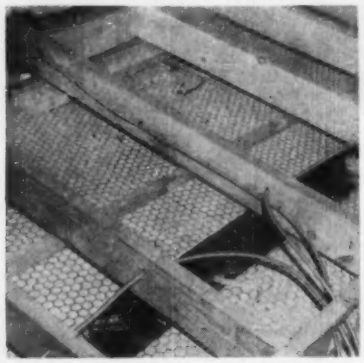
The work shown in the photos was done in another dining area being remodeled in the restaurant. Here, as part of the work, the floor was being terraced around the sides and ends of the interior to provide an elevated platform around the room. When the platform flooring is complete, the entire floor area will be carpeted and table booths installed on the platform. Charley and Les were to put in steplight circuits for the platform. This consisted of running 2-conductor No. 12 cable to feed recessed incandescent steplight boxes, each equipped with one 7½-watt standard base incandescent lamp.

FIRST STEP of the job was to drill holes through platform frame. Here, Les is going down line drilling holes for cable runs to boxes.

FOLLOWING UP, Charley runs cable between first two steplight box locations, cuts the proper length, then runs cable to next box, etc.

BOX LOCATION in vertical part of platform edge was first marked out with template, then drilled and cut out with keyhole saw.

HOME RUN of step lighting circuit was made by running length of cable from existing outlet down through wall and back to one of steplight boxes.



INSTALLED CABLES—showing home run stapled to board and leads draped through one steplight mounting hole—are here ready to be covered over.

SATISFIED CUSTOMER, shown here inspecting wiring, is fabulous New Orleans restaurateur and walking jewelry store "Diamond Jim" Moran.

Structural Details of Office Rewiring

A roundup of structural problems in running new conduit, installing boxes and utilizing existing wireways on a Tulsa, Oklahoma, modernization job.

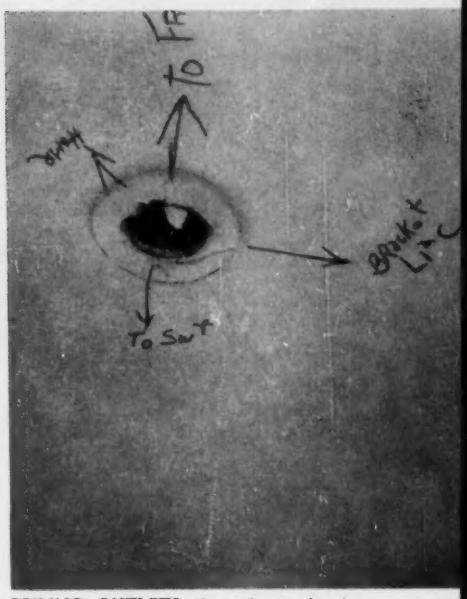
By Richard Almond,

Almond Electric Co.,
Tulsa, Oklahoma

EXISTING CONDUIT (arrow), shown here on second floor, was uncovered by removing plaster and lathe. New risers were to be installed to light and power panels in electrical closet at "A". Existing home runs here and throughout building, were used as much as possible; were rerouted to new panel location. Existing branch conduit was also used. Job called for minimum cutting and removal of plaster. Ceiling outlet is shown at upper right.

BASEMENT CONDUIT for new lighting circuits was installed between floor joists; was laid in notches where it crossed joists (arrow). Electricians were allowed to use notches in joists where they existed, but could not make new notches.

INSTALLING SWITCH outlet in basement involved breaking through plastered partition, removing wood lathe to mount box in wall and running Greenfield to lighting outlet. Use of notch in joist is shown at top.



CEILING OUTLETS throughout the interior were marked with crayon, as shown, to indicate conduit in ceiling, direction of runs and tie in to other wiring devices. All old wiring was pulled out; conduit was rewired to 50% fill.

OUTLET BOXES for lighting and telephone are installed on conduit runs, clamped to brick wall in basement (right). Finished wall to be constructed here will conceal pipe and be flush with face of boxes. Another outlet on each conduit run is mounted in another room on other side of brick wall (left).

INSTALLATION NIGHTMARES were uncovered with regularity when walls were broken away to get at concealed conduit. Here, at side of old, covered-over fireplace, conduit run from ceiling outlet in one room ran down in wall alongside conduit run from ceiling outlet in adjoining room. Wires from two runs were twist-and-tape spliced to a short piece of cable which tied into receptacle outlet box (was at arrow). Conduit was rewired for new lighting circuits; convenience receptacle was installed at end of conduit.

CONVERSION of a building interior from apartments to office suites here presents a study in the structural problems of electrical modernization. This building, in Tulsa, Okla., was a 2-story apartment house with a basement. When conversion is completed, the basement and first and second floors will be wired and decorated as office space. Structural rearrangements and additions are extensive. All windows are being closed over; lighting and air conditioning will be completely artificial. Interior partitions and decorative finishes are being remodeled throughout.

Two new services are being installed —a 3-wire, single-phase, 240/120-volt, lighting service of three No. 1/0, and a 3-wire, 3-phase, 220-volt power service of three No. 2. On each of the three floors, new fluorescent lighting will be installed. Air conditioning and heating will be provided by an individual 220-volt, 3-phase, water-cooled unit on each floor: 3-ton cooling, 84,000 Btu/hr heating—basement: 5-ton cooling, 84,000 Btu/hr heating—first floor; 7½-ton cooling, 112,000 Btu/hr heating —second floor.

Structural details of the electrical installation are shown in the photos.

Installing a Feeder Panelboard

A look at job methods and installation details on the main feeder panelboard for Independent Linen Service Co., Little Rock, Ark.

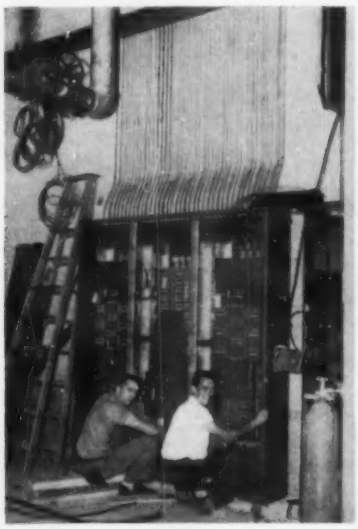
By T. A. "Bert" Steely,
Chief Engineer,
Harvill-Byrd Electric Co.,
Little Rock, Ark.

AS PART of the complete electrical construction of the Independent Linen Service Co., a large commercial laundry, Little Rock, Arkansas, a modern setup of service equipment and feeder distribution panelboard was installed. Located in the boiler room area at one end of the one level building, the equipment is mounted against the wall which separates the boiler room area from the main laundry interior.

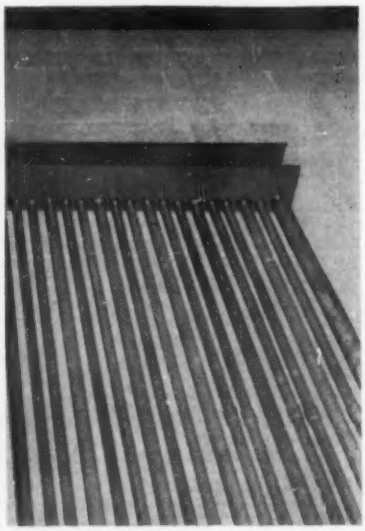
Within the building, there is a total of 55 motors in all, ranging from ½ hp to 40 hp. Most of these motors are in the large, main laundry area and feed a variety of motorized equipment used for washing, drying, ironing and other laundering operations. These motors are fed individually in conduit from the main feeder panel. Other motors—those for air handling equipment and miscellaneous boiler room power—are fed in conduit from a motor control panel alongside the main feeder panel.

The accompanying photos point up the fine workmanship on this installation.

ELECTRIC SERVICE to the building is 3-phase, 240 volts, from an open-delta utility transformer secondary with a grounded neutral taken from the midpoint of one of the transformer phase legs. Service conductors—3 No. 500 MCM conductors per phase and 3 #1 conductors for the neutral—come through the cement-block wall from the outside into the CT cabinet (arrow). The SE conductors are divided among three 3½-conduit runs coming into the cabinet. Three other sections of conduit are shown here for carrying the SE conductors down into the main switch enclosure. This switch is a 1200 amp, 240-volt, 3-pole fused Pringle switch with a continuous neutral bus (at right of switch). An inverted "L" piece of angle iron is used for each of two legs supporting switch cabinet. Short section of wireway, at lower right, feeds conductors to the main panel.



FEEDER PANELBOARD contains three sections of Saflex, heavy-duty, horsepower-rated, double-break, dead-front feeder switches. Each switch is opened by opening the door which provides access to the fuses. The whole unit contains 3-pole, fused switches as follows: 1- 400A, 2- 200A, 12- 100A, 10- 60A and 30-30A. Two 200-amp, 2-pole switches are used for the 120/240-volt, 3-wire, single-phase feeders to lighting panels. Short section of wireway coupling the panelboard to the Pringle switch enclosure can be seen at right. This piece was welded into place. The bank of conduit from the panelboard up to the wall-mounted wireway carries individual circuits of motor feeders and lighting feeders. The panelboard contains space for considerable expansion of its handling capacity to meet future growth of motor or lighting loads.



CONDUIT BANK from the panelboard feeds the wall-mounted wireway as shown here. Feeder circuits are carried along wireway to various points at which they pass through the wall and are carried in individual conduit runs to the various motors in the laundry. This wireway will also connect with a motor control center to be mounted a short distance away from the feeder panelboard along the wall. This motor center, fed through the wireway from the feeder panel, will house 14 starters and pushbutton stations for air handling equipment. Motors on machines in the laundry area have individual starters, pushbuttons and unfused disconnects at their locations. Lighting feeders are also carried from the main panel in the wireway, then through the wall to lighting panels. Open-top industrial fluorescent units are suspended in the main laundry area.

ten million jerks a year...

can't shake these connections loose

The problem was simple—but the solution was ingenious.

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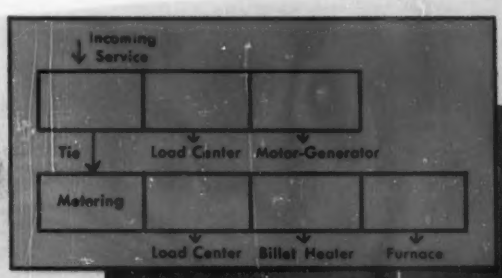
Geo. M. Baxter, Plant Engineer at Harper, points to tie unit.



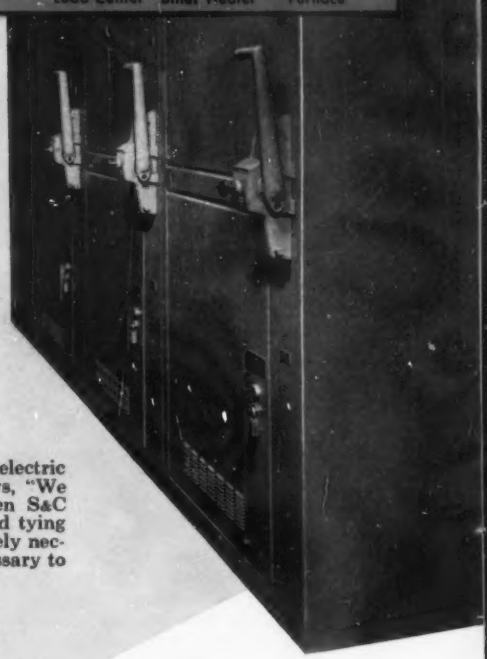
THE H. M. Harper Company did! This company, located in Morton Grove, Illinois, manufactures nonferrous fastenings. A few years ago it began a long range plant expansion program by modernizing its electrical system — distributing its power at high voltage.

The first step was installation of S&C Metalclad Switchgear—a 3-unit assembly which served a load center and a motor-generator, and provided a spare for future needs. Two years later a second 4-unit assembly was added to serve the new metals plant, and was tied to the incoming service through the spare unit of the original assembly.

S&C Metalclad Switchgear is engineered to perform all the necessary protective and switching functions—yet it costs only about half as much as most alternate equipment. As a result the economies from its use are often tremendous.

Mr. Don Rieger

of C & H Electric Co., who planned and installed the electric power distribution system at The H. M. Harper Co., says, "We were especially pleased that our original choice had been S&C Metalclad Switchgear when the latest changes necessitated tying the two switchgear assemblies together, because it was merely necessary to change fuses in the tie-in unit . . . it was not necessary to replace expensive breaker equipment."



Added S&C Switchgear serves a billet heater, furnace, and load center, and supplies metering.

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Motor Shops

Heavy-Duty Dynamic Balancer

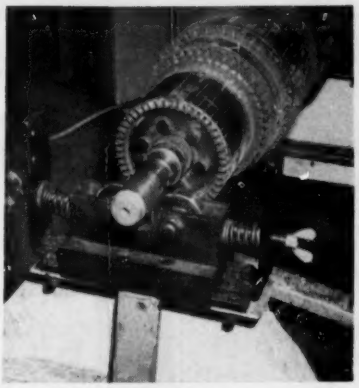
Rotors up to 46-in. diameter with shafts up to 6 feet in length can be dynamically balanced on a machine built in the motor repair department of the Barker-Fowler Electric Company, Lansing, Mich. The heavy-duty unit, designed by shop superintendent Mason Green, has a sturdy steel frame with adjustable end saddle assemblies to seat the rotor shaft. The rotor is turned by a pivoted V-belt assembly powered by a direct current motor with variable speed control.

The rectangular base is 78 inches long, 29 inches wide and 14 inches above floor level. It consists of inverted 3-in. steel channel welded to heavy angle-iron legs. Rigidity on the long span is provided by two lengths of 6-in. I-beam welded to the channel and legs; on the short span by gusset plates. Two 6-ft lengths of P1000 ($1\frac{5}{8}$-in. square) Unistrut channel welded to the top of the base frame provides the supporting "rails" for the adjustable end saddles.

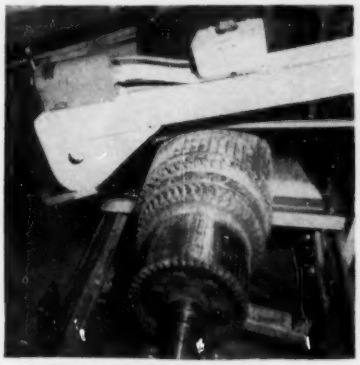
Each end support consists of a tapered section of 8-in. steel I-beam (14 in. wide at top, 24 in. wide at bottom) welded to a 29-in. length of inverted 6-in. channel which rides at right angles to the "rails". Two $\frac{1}{2}$-in. bolts at each end of this channel rigidly fastens the end support to the rails at any designated position. Both supports can be adjusted for long or short rotors with various shaft lengths. Both are topped with a section of $\frac{1}{2}$-in. thick steel plate to form a smooth surface on which the free-moving shaft saddles can rest.

The free-moving saddle is actually a hollow steel block made of five pieces of $\frac{1}{2}$-in. thick steel plate. This $8\frac{3}{4}$-in. long by $2\frac{1}{2}$-in. wide "box" houses two $3\frac{1}{4}$-in. diameter, plastic-seal ball bearings on $3\frac{1}{2}$-in. centers to form the "seat" for the rotor shaft. Bearing studs are countersunk on the inner side of the block to provide clearance for rotor shafts with big shoulders. Four ball bearing (No. 87012 bearings) "wheels" at the base of the block permit the saddle to ride freely back and forth on the end support. Two pieces of 1-in. by 2-in. angle iron form guides which prevent the block from shifting left to right along the rotor shaft.

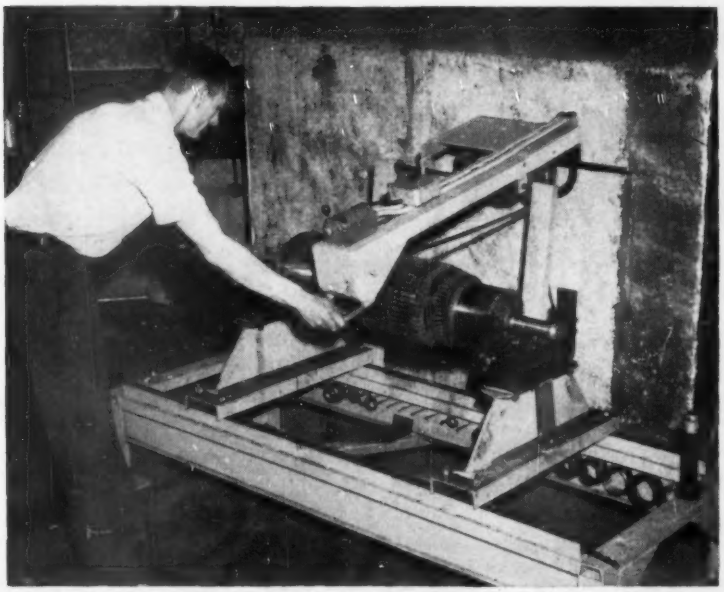
Two $\frac{1}{2}$-in. thick steel uprights, bolted to the saddle bedplate, support threaded stop-bolts and a heavy coil spring at each end of the movable block. As the rotor spins during the balancing operation, the saddle block moves back and forth against this spring pressure. Amount of movement depends upon the amount of unbalance in the rotor.



FREE-MOVING SADDLE on end support seats rotor shaft between two large ball bearings. Block rides on ball-bearing "wheels," moves back and forth in angle-iron guides against coil spring pressure when rotor spins.



MOTOR CONTROL on top of driving arm consists of a three-position switch and shunt field rheostat control to vary speed of direct current motor driving V-belt over idler sheave under switch.



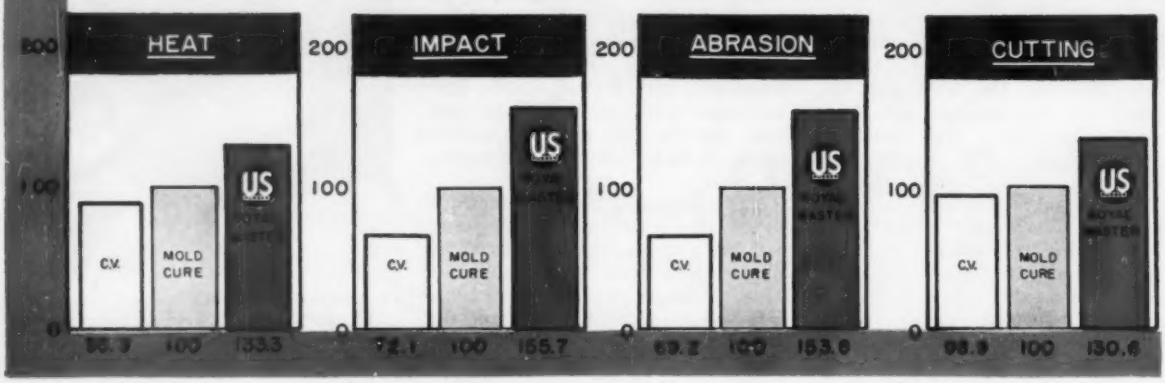
DYNAMIC BALANCER in the Barker-Fowler Electric Co. shop at Lansing accommodates rotors up to 46-in. diameter with shaft lengths up to 6 feet. Adjustable end supports with free-moving ball-bearing saddles ride on Unistrut rails welded to heavy base frame. Pivoted driving arm is powered by a ¾-hp. dc motor.

The driving assembly consists of a ¾-hp dc motor driving a single V-belt over an idler sheave at the end of a steel channel arm. Arm and motor base pivot on an upright support at the back of the balancer. Motor control is provided by an "on"—"off"—"reverse" switch mounted on top of the pivoted arm. Motor speed can be varied by a shunt field rheostat control mounted directly behind the starting switch.

To balance an armature, the

STARTLING

Comparative performance of portable cords related to major life factors.



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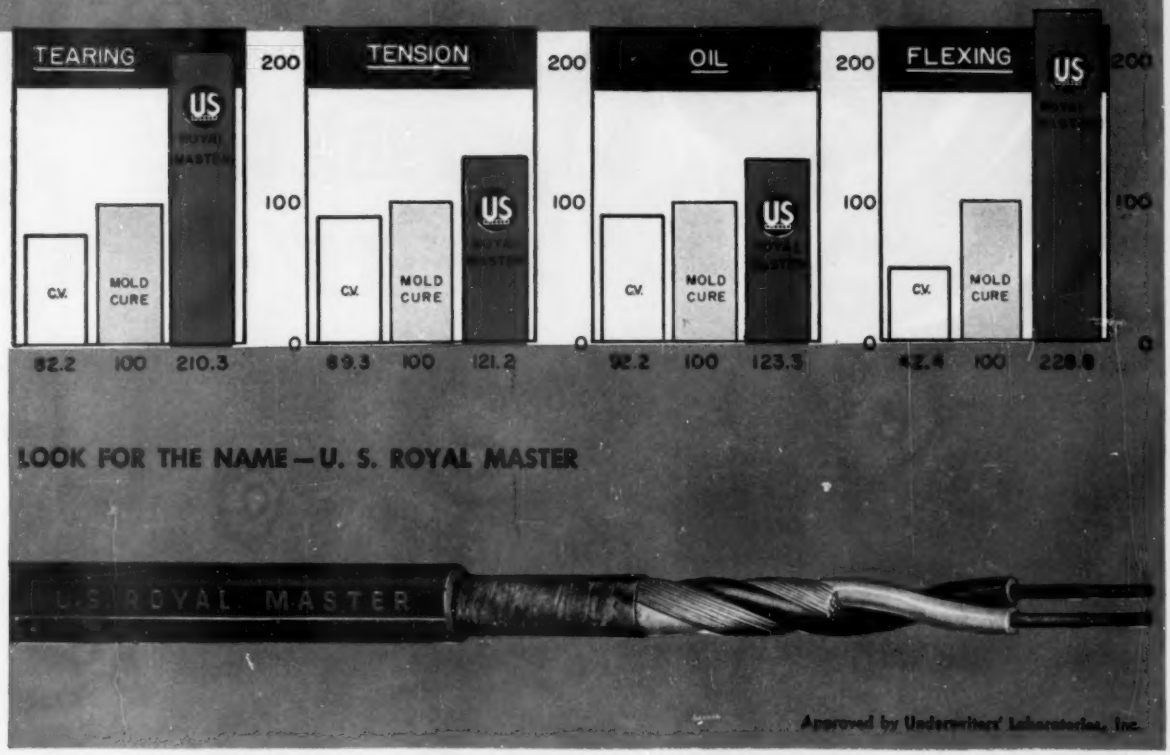

Cord construction completely reexamined. Over two years ago, U. S. Rubber engineers began a thorough reexamination of electrical cord design and construction. More than a thousand cords, including those of all major competitors as well as our own U. S. Royal Cord, were thoroughly and painstakingly analyzed. Over 10,000 tests were made to determine the principal causes of cord failure.

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JOY MANUFACTURING COMPANY guarantees jumpers 2 years

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DIESEL CONTROL JUMPERS take one of the roughest beatings it is possible to give portable cable. Vibration and flexing are continuous. Temperature variation is extreme. Oil always present. Sunlight... Ozone... Every element which quickly destroys ordinary cable is abundantly present where these jumpers are at work. Yet Joy Manufacturing Company is able to guarantee their Multi-Flex Diesel Jumpers "to provide at least two years of satisfactory, trouble-free service." The 27 to 27 Pole Multi-Flex Jumper illustrated here is made with four lengths of seven-conductor Bronco 60 Certified cable. You can read the branding on the jackets. Note especially the phrase—*60% Neoprene by weight*. It is this full measure of Neoprene which gives Bronco 60 Certified its superior resistance. Superior toughness combined with superlative flexibility make this cable your first choice for rugged applications. Specify... and be sure you get... Bronco 60 Certified.

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mechanic adjusts the end supports and saddle block to rotor dimensions. The driving motor is then started and the arm lowered until the V-belt contacts the rotor. Contact is maintained until the rotor attains the desired speed, then the arm is lifted and the motor shut off. As the rotor spins freely in the bearing saddle, observations are made to determine the position and amount of unbalance at one end of the shaft. After one end is balanced, the operation is repeated on the other shaft end.

Motorized Insulation Creaser and Cuffer Saves Time in Motor Shop

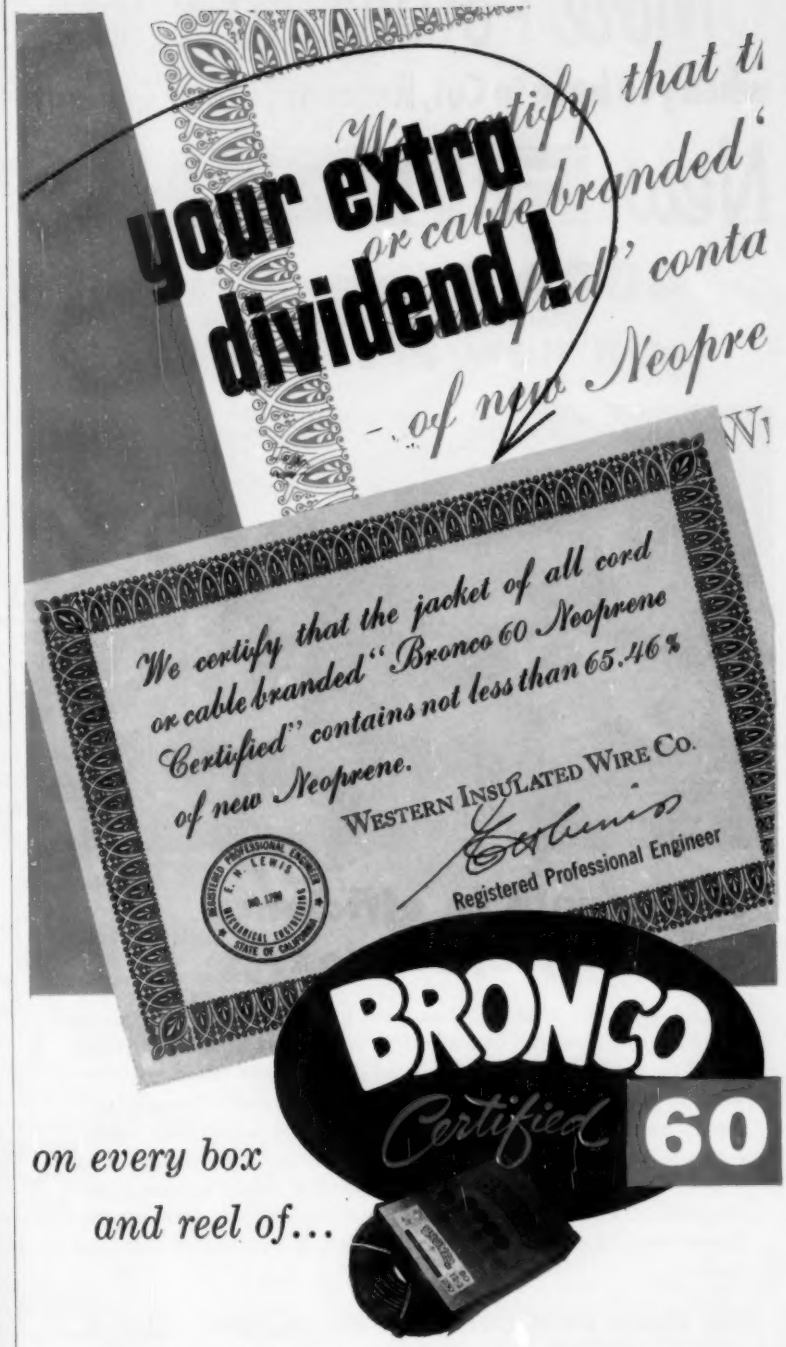
A 10% saving in time plus the advantages of portability were realized by Phoenix Electric Company, Mansfield, Ohio, when they motorized a standard insulation creaser and edge cuffer and mounted the units on a portable frame. Now slot insulation can be cuffed and creased on a production-line basis without mechanic fatigue. The portable combination unit eliminates backtracking from workbench to table where the two units were formerly clamped.

Both C. A. Bonham and his son Bob, who operate the motor repair shop, are keen students of cost-cutting techniques. That's why they mechanize every possible shop operation. The creaser-cuffer combination is their latest effort.

The portable feature is provided by a sturdy, rectangular base frame 25 inches long and 20 inches wide. Fabricated from sections of 1-inch angle-iron, it stands 21 inches off the floor and rolls on four 2½-inch diameter casters.

Four angle-iron uprights welded to

MOTORIZED CREASER-CUFFER combination was developed by Phoenix Electric Company when the two units were mounted on a portable base.


your extra dividend!
We certify that the jacket of all cord or cable branded "Bronco 60 Neoprene Certified" contains not less than 65.46% of new Neoprene.
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on every box and reel of...

This certification which appears on every box and reel of Bronco 60 Certified portable cable assures you that the protecting jacket contains *a bonus quantity of Neoprene...65.46%!* More Neoprene gives you greater oil-resistance, longer wear, more flexibility. No guesswork. No purchasing by faith alone. You *know* what you are getting. This certificate tells you *exactly* what...and how much. Be sure the wire you buy is *Certified*...and branded.

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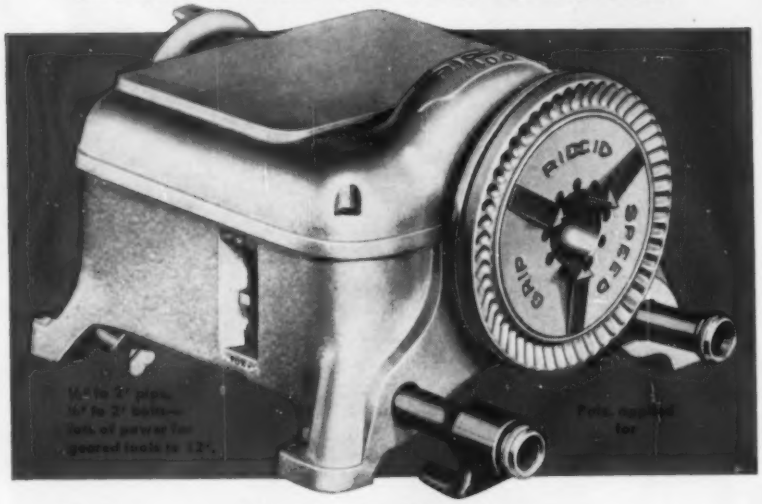
when you have to Cut, Ream or Thread Conduit

New RIDGID

400A Power Drive with new SPEED CHUCK



A bargain in efficiency and easy operation!

The amazing new chuck on this 400A is not just another hammer chuck. It operates on a new principle of gripping conduit, pipe and rod. Guaranteed to hold any kind of pipe securely both ways, forward or reverse. No slipping, even in driving geared tools. Extra easy to operate: close jaws on work with hand wheel, sock lightly —motor action makes it grip tighter; releases easily by turn of hand wheel. Thousands of these efficient, powerful, durable units in use everywhere. For most service for your money, ask your Supply House for the new 400A. (No. 400 with lathe-type chuck also available.)—

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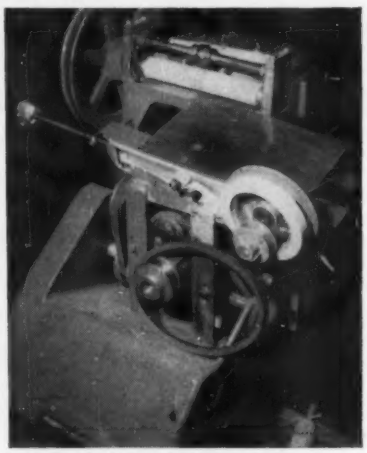
RIDGID
Work-Saver Pipe Tools

CUFFER TABLE is at comfortable 45-degree working angle. Foot-switch provides instant operational control of motorized unit, leaves both hands free to guide paper in tape slide.



TAPE REPLACEMENT is simple. Cuffer assembly is tilted forward, V-belt disengaged and roll slipped over sheave onto tape drum. Hand screw adjusts V-belt tension by sliding cuffer unit along supporting bracket.

the top of the frame (at one end) support the creaser and vertical base for a 1/6-hp, 1,200-rpm, single-phase, 110-volt motor. A 1½-inch pulley on the motor drives a 9-inch V-belt sheave which replaces the hand crank on the creaser roll. The two thumb-screws which formerly applied pressure to the creaser-blade shaft were removed and replaced by a chain and bar trapeze extending just below the motor base. This is connected by turnbuckle to a solenoid mounted to a cross-piece on the base frame. Both solenoid and motor are controlled by the same toggle switch. When the motor starts turning the creaser roll, the circular blades are pulled down into contact position and the insulating paper is pulled through and creased. When the switch is "off" the blades are returned to their original

two switches in one!

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SHUTLBRAK SWITCHES

Here's new switching convenience, flexibility and economy — both in cost and in operation — a switch that combines *both* interlocking and non-interlocking switch features in one unit.

Underwriter's Laboratories' approved, these new units embody all the features that made the Ⓕ Type SA Shutlbrak switch so popular, *plus* the added convenience and flexibility of quick, easy conversion to either interlocking or non-interlocking operation.

For motor control, service entrance or any job requiring a *standard duty* operating switch, these new units are ideal.

For additional information on these new, double-duty, low cost, safe, dependable switches, write for Bulletin No. 500 or consult your nearest Ⓕ representative listed in Sweet's. He'll be glad to discuss them with you.

Ⓕ SCSD SHUTLBRAK SWITCH HIGHLIGHTS

Quick-make and quick-break operation with interlock on full-opening cover. (Special release provided for access in "on" position by authorized person.)

Quick conversion to non-interlocking operation by manually shifting a simple mechanism inside the door — needs only a screw driver.

Ⓕ Kamklamp, pressure type fuseholders with solderless pressure connectors.

Rotary operating handle suitable for padlocking.

Positive "on" and "off" indication in cover.

CAPACITIES:

Type SCSD, 30 to 200 amps, 250 and 600 volts AC or DC 2, 3, and 4 poles, single throw.

Original design Ⓕ SAHD Shutlbrak Heavy Duty enclosed switches 30 to 1200 amps, also available.

Frank Adam Electric Co.

BOX 357, MAIN P. O. • St. LOUIS 3, MO.

Makers of:
BUSDUCT • PANELBOARDS • SWITCHBOARDS • SERVICE EQUIPMENT • SAFETY SWITCHES • LOAD CENTERS • QUIKHETER

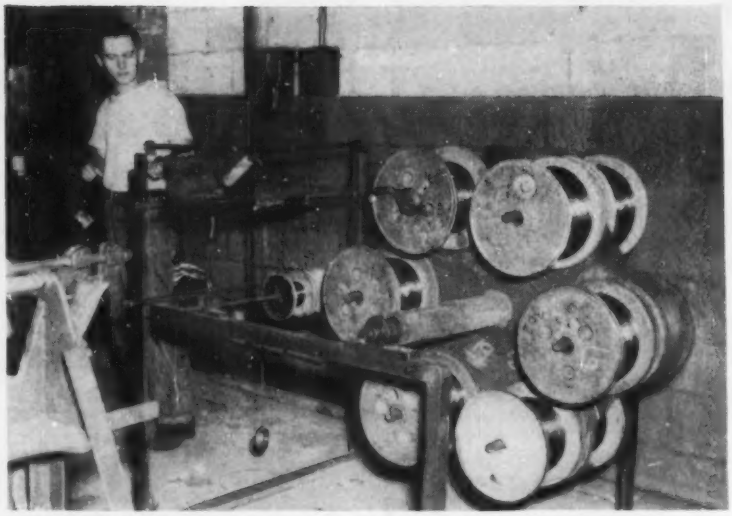
position by spring pressure. This arrangement prevents possible damage to the roller by constant blade contact when the unit is not in operation. Effective working height of the creaser assembly is about 42 inches above floor level. A basket, hooked on the creaser frame, catches the slot insulation.

The motorized cuffer is mounted to the other end of the base frame. One side of the cast motor enclosure (part of an old steak cuber) is fastened to a pivot bar; the other rests on the base frame. A 1/6-hp, 1,800-rpm, single-phase, 110-volt motor drives a gear-reducer through a V-belt connection. The reducer, through a second V-belt connection, drives the geared mechanism which cuffs the insulation paper with tape. The hand crank on the standard cuffer was merely replaced with a V-belt sheave.

In normal operating position, the motor enclosure rests on the base frame. This puts the cuffer table at a comfortable 45-degree working angle. Only when a new roll of tape is to be added is the cuffer unit tilted forward on its pivot bar. When this is necessary, the C-clamp is loosened and the tape guide and V-belt are removed. A new roll of tape is slipped over the sheave onto the retaining drum and threaded into operating position. The V-belt is replaced and tension adjusted by a hand-operated adjusting screw which slides the cuffer unit along its supporting bracket. Once the proper belt tension is secured, the C-clamp is tightened, tape guide replaced and the unit is ready for its next cuffing job.

A foot-pedal switch controls the cuffer motor. The operator has both hands free to guide the insulating paper through the tape slide and can start and stop the unit at will.

CREASER ROLL is V-belt driven by motor. Solenoid at base pulls chain trapeze down to bring creaser blades in contact with roll. Both are controlled by same switch. Springs push blades to "up" position when power is off.



COMPACT RACK, with six spindles passing through a 3-foot circular steel plate, holds a dozen 2-foot wire reels. Wheel may be readily revolved for wire selection, while tension devices for take-offs are mounted directly to the general framework of the assembly.

Ferris Wheel Holds Dozen Wire Reels

A 3-ft-diameter circular sheet of ¾-in. steel, supported by a hefty 3-in. diameter shaft, forms the basis for a helpful wire reel storage rack and selection means in the shop of the Standard Electric Motor Company of Linden, N. J. Reminiscent in appearance to a Ferris wheel, the circumference of the steel plate is pierced by six 20-inch lengths of 1-inch pipe, equally spaced around the wheel. These spindles and the spacing between them makes it possible to conveniently support a dozen 24-inch diameter wire spools. To take care of larger reels, every other spindle may be left unoccupied and, if the reels are relatively smaller several may be supported on each end of the spindles.

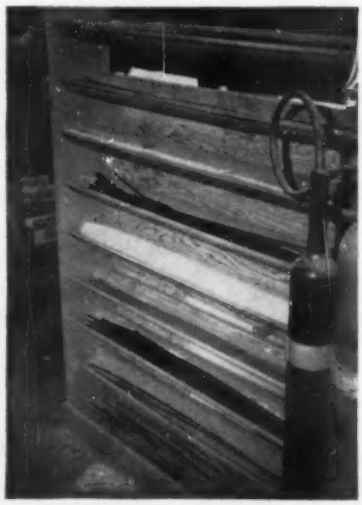
The shaft, as shown, is cradled by bearings supported by the sturdy angle-iron framework, and tension devices for the take-offs are also mounted directly to this frame. The wheel may be manually revolved for ready selection of the proper wire reels but, due to the overall weight and inerita of the assembly, the wheel will not revolve when the only active force is the tension of the unreeling.

Gutters Make Good Racks for Sleeving

Insulating sleeving is stored neatly and conveniently in the shop of Wismer & Becker, Sacramento, Calif., in a series of racks formed from lengths of common metal gutter stock—identical to that fastened to the eaves of residences for the purpose of directing rain runoff from the roof.

These gutter sections have been cut into equal lengths and secured at each end to wooden uprights, forming a tier of horizontal trough-like shelves to hold the lengths of sleeving. To make the entire assembly more rigid and to prevent the sleeving from slipping over the rear lips of the gutter sections, a sheet of quarter-inch plywood has been nailed to the back edges of these wooden standards.

Due to its compactness, the rack may be positioned wherever convenient.



SECTIONS OF RAIN GUTTER form a series of troughs for storing sleeving. Compact design conserves floor area.

WESTINGHOUSE DISTRIBUTOR REPORT

Here's how you can show management ways to cut costs now

Now's the time, all right . . . time you can turn a "breather" into a real opportunity.

Breather? We mean the more normal production schedules today, compared with the frantic, all-out pace followed over the past few years.

And you can use it to advantage.

You can show management how it enables them to make badly needed change-overs, with less interference to operations than before. You can show how lighter machine schedules and less crowded shop conditions mean that partial shutdowns for replacement can be made more easily, more economically.

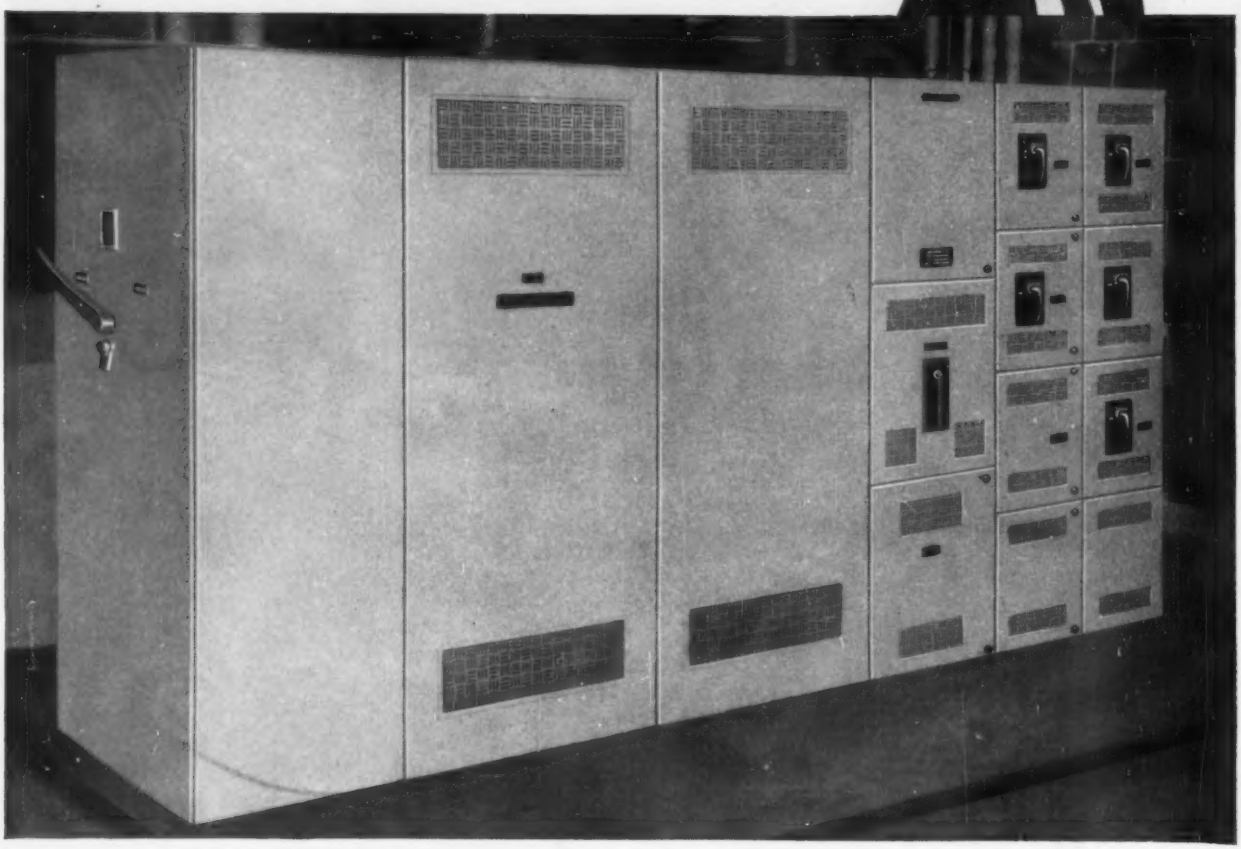
And you can show how modern electrical equipment means better, lower cost production *today* . . . when costs are really tight. DP-5009-A

The next seven pages help you show why . . .

YOU CAN BE **SURE**... IF IT'S

Westinghouse

Point out the advantages of high-voltage distribution . . . and you'll show management how to get more productive output today.



Carry high voltage close to loads with dry-type power centers

Long, low-voltage feeders—a costly practice still followed by many plants—can be eliminated with Westinghouse dry-type power centers.

Combining transformers and circuit protecting equipment in a single enclosure, they permit high voltage to be carried close to the center of the load. Result: reduced line losses; improved voltage conditions—lowering operating costs and stepping up efficiency of motor drives and plant lighting.

Further, Westinghouse dry-type power centers eliminate the need for separate vaults . . . the expense of storing or replacing oil. And they are inherently flexible. New feeders can be added easily as power requirements grow. DP-5009-B

And the features of Westinghouse bus duct mean this to management: flexibility today to easily handle production line changes tomorrow . . .

YOU CAN BE SURE...IF IT'S

Flexibility of plug-in bus duct solves changing load requirements

The frequent rearrangements and additions modern industry makes in its production lines are readily handled with Westinghouse plug-in bus duct.

By providing power availability at one-foot intervals, it enables relocated or new machines to be tied-in quickly, with a minimum loss of production time. And power take-offs are easy. Merely slide cover away from plug-in receptacle. Then, plug in and fasten unit to duct.

Westinghouse plug-in bus duct is prefabricated. It installs easily with cantilever or "C" clamp hangers, adapts to any layout and is completely salvageable . . . can be dismantled, reassembled, expanded.

Comes in four types to meet any distribution need. Also available with aluminum bus bars.

DP-5009-C

Westinghouse

Spell out better seeing conditions through planned lighting . . . and you'll show how to maintain better quality control now.

New ventilated high bays in the rear of this plant graphically show higher illumination levels. Compare these with older units in foreground. DP-5009-D

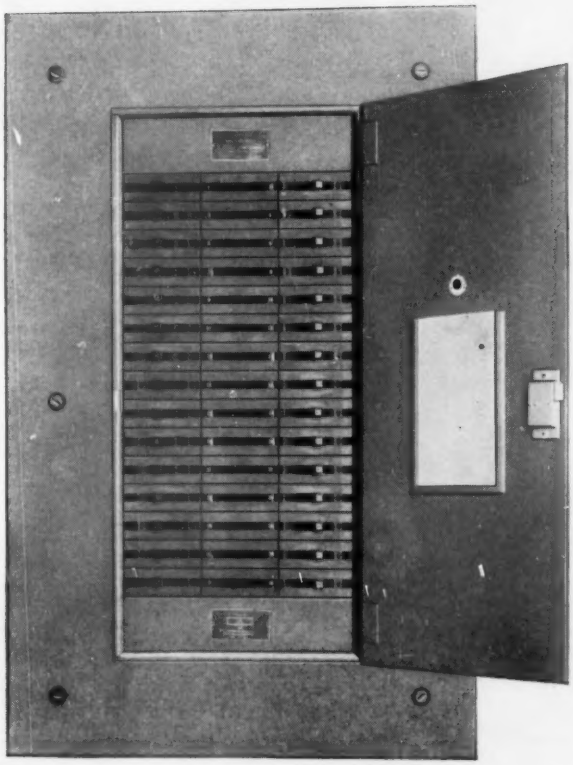
Ventilated mercury high-bay fixtures mean more light, less maintenance

Mercury lighting and Westinghouse ventilated high-bay fixtures bring these immediate benefits to the production area: increased illumination and lower maintenance costs.

The Westinghouse high-bay fixtures have an opening between the neck and reflector. This provides a constant air stream that sweeps the entire reflector surface clean. Less manual cleaning is needed; lighting efficiency is maintained over a longer period—extremely practical advantages when over-all economy is considered.

In addition, these new ventilated high-bay luminaires last longer since the reflector and extension neck are separately spun pieces. The ventilating system is not a part of the extension or reflector. This means *no weak spots.* There's no punching of holes to weaken the structure in critical areas. This means *longer life.*

Protect modern lighting installations with circuit breaker panelboards



A single lighting outage adds up to a double cost. There's the labor and materials cost—necessary to restore service. And there's the cost of production down time—the loss of man and machine hours.

Both can be virtually eliminated with Westinghouse circuit breaker panelboards. Their AB "De-ion®" circuit breakers won't trip on harmless overloads . . . yet, permit quick restoration of service when circuit interruptions occur. A flip of the breaker handle restores service instantly and safely. No need to call a maintenance man or electrician. No fuses to store. No chance of over or under fusing. DP-5009-E

Type NH1B Lighting Panelboard—for 277/480-volt, 3-phase, 4-wire lighting circuits. Made up of "E" frame breakers. "De-ion" arc extinction plus thermal and magnetic tripping devices gives maximum protection.

YOU CAN BE SURE...IF IT'S Westinghouse

Cover off the importance of backing production equipment with modern drives . . . and you'll show how to bring about immediate operating economies.

Meet demand for operating economy with better protected Life-Line "A" motors

The drives *behind* production equipment can spell the difference between reasonable and excessive operating costs. That's why the new Westinghouse Life-Line® "A" motor is a basic consideration.

Here's a power package guaranteeing better performance . . . a better protected motor that's smaller, yet stronger and electrically longer lasting than *any* conventional motor on the market today. Here are the advantages found only in Life-Line "A":

1. **New 4-way seal, pre-lubricated bearing.** Needs no lubrication; protects against under or over greasing and entry of foreign matter . . . resulting in longer motor life.
2. **New Bondar conductor insulation.** Means more resistance to heat and contaminants . . . longer motor life.
3. **New Bondite stator insulation.** An impregnating varnish fortified with silicone which resists water, vapor and chemical fumes. This means dependable operation under any atmospheric conditions.
4. **New Mylar* slot insulation.** Greater dielectric and mechanical strength which means fewer motor failures. DP-5009-F

*Du Pont registered trade-mark.

Modern circuit protective devices assure better production efficiency

Lost production time. Heavy maintenance costs. You'll cut these by recommending modern circuit protective devices shown here. Have management consider:

AB-1 Circuit Breakers. They provide complete protection against short circuits and high overloads . . . literally paying for themselves in many cases by eliminating *unnecessary* down time.

The Westinghouse "De-ion" circuit breaker measures both time and current . . . trips only on dangerous overloads that could damage production equipment. And when power is interrupted, service is restored quickly and safely. A flip of the circuit breaker handle does it.

There are no fuses to replace, nothing to wear out, practically no maintenance of any kind.

Safety Switches. A complete, high-quality line to meet your requirements when managements request fusible protective devices. The new Type "H", for example, is now ready for heavy-duty industrial applications.

It provides a NEMA-1A dust-resisting enclosure with an interlocked cover that cannot be opened when switch is in the "ON" position. Too, line terminals are covered by a Micarta® shield—minimizing exposure to live parts when inspections or fuse replacements are made. DP-5009-G

YOU CAN BE SURE...IF IT'S Westinghouse

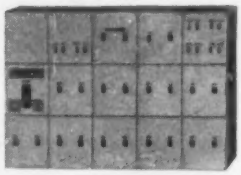
LIFE-LINE "A" MOTORS

LIFE-LINE STARTERS

AB-1 CIRCUIT BREAKERS

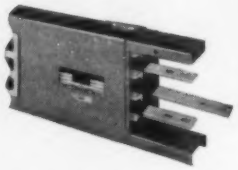
PANELBOARDS

CAPACITORS



BUILDING-TYPE SWITCHBOARDS

POWER CENTERS

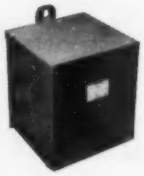


BUS DUCT

CONTROL CENTERS

INDUSTRIAL LIGHTING

SAFETY SWITCHES



DRY-TYPE TRANSFORMERS

A one-stop apparatus source for your modernization needs

The Westinghouse distributor in your locality is equipped to serve all your apparatus requirements.

From centrally located warehouses he can supply, complete from stock, full product lines—matched Westinghouse equipment recognized for their simplified and standardized design. This means easier installations . . . gets you on and off the job quickly.

Additionally, the Westinghouse distributor in your area offers you the services of Westinghouse headquarters engineers . . . product and application specialists who are closely identified with the construction industry. Operating on a team basis, they are readily available . . . when and where you need them . . . to help you handle many of your electrical problems.

One call to your Westinghouse distributor puts this combination of product and engineering services to work for you. Get in touch with him for a survey of your electrical needs.

DP-5009-H

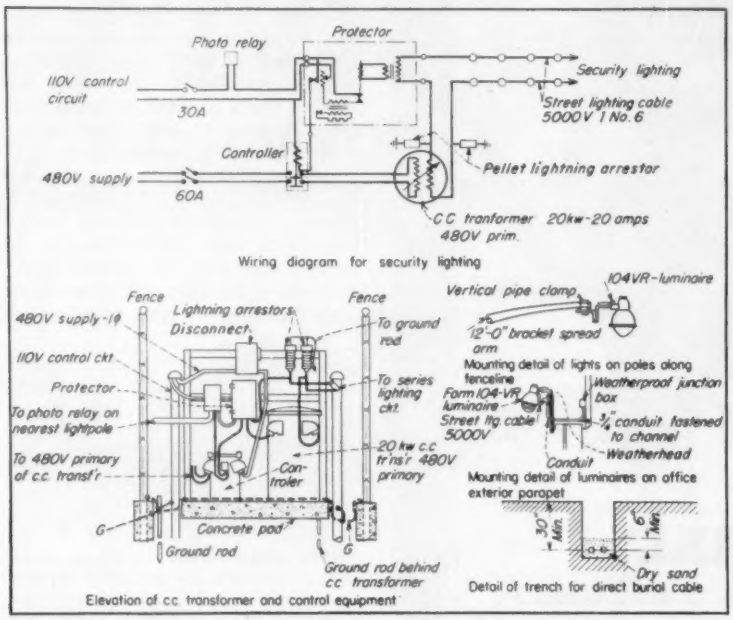
YOU CAN BE SURE...IF IT'S Westinghouse

Practical Methods

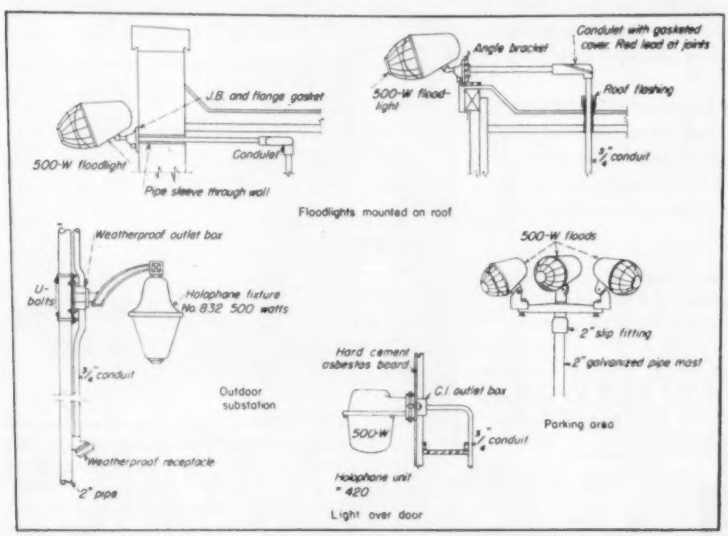
Protective Lighting Combines Variety of Fixture Mounting Methods

INSTALLATION

Electrical contractors Langdon & Hughes of Utica, N. Y., installed more than a dozen types of protective lighting units at a local G. E. research and production center, wiring and mounting being engineered by Walter Kidde of New York City. This exterior protective-lighting installation includes both medium- and wide-beam tower-mounted luminaires in parking areas, ornamental pole-mounted units along roads, 10,000-lumen series-connected floodlights along fence lines and atop building parapets, low-wattage steplights at entrances and along walkways, plus functional or ornamental fixtures at such locations as the substation, an oil storage depot, shipping docks, outdoor storage areas, entrances and the like. This variety emphasizes the fact that protective lighting is constantly increasing in extent and importance and expanding simultaneously in variety, methods of mounting, and methods of regulation.



CONSTANT CURRENT transformer and associated equipment is pad-mounted in fenced enclosure and is activated by pole-mounted photo relay. Feeders from substation to lighting units are buried 30 inches below ground in layer of sand.



LIGHTING UNITS are mounted on poles, brackets, along walks and parapets by means of wide assortment of clamps, brackets, masts, wall sleeves and weatherheads. Protective lighting units vary in design, size of lamps, beam spread and characteristics of glassware and housings.

This entire G. E. system is activated automatically through photocell relays, operating when natural light diminishes to predetermined levels, and all circuit wiring is either conduit-protected indoors or trench-laid between layers of sand at a minimum depth of 30 inches when lighting standards are outdoors.

Extensive grounding of equipment is also practiced, with 10-foot ground rods driven near all light towers and poles, substations and switchgear. Conduits inside buildings are grounded to the structural steel of the building itself, and this structural steel, in turn, is also grounded through welded cable connections and additional ground rods driven alongside building columns. All exterior junction boxes are weatherproofed, and the overall system is kept in peak operating shape through frequent inspections and maintenance routines.

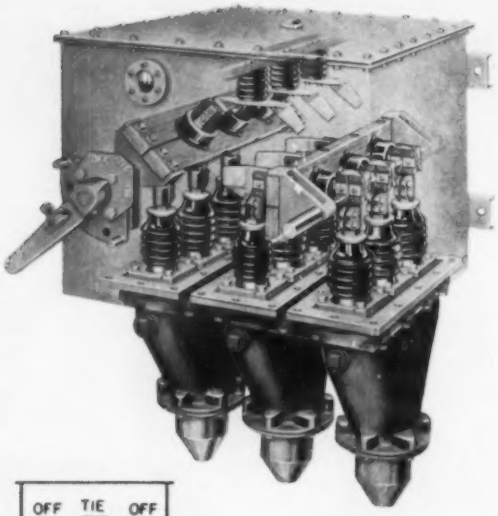
Power for the system is obtained through a 20-kw constant-current transformer, with primary voltage at 480. Transformer, controller, protector, lightning arrestors and related equipments are mounted on a 3-by-6-foot concrete pad, fence enclosed, while the controlling photo relay is pole mounted so as to obtain unobstructed sky brightness values for regulating purposes. Primary service to the transformer station and secondary service going out to lighting units are both underground via No. 6 cables, primaries being conduit-carried and secondaries trench-laid as direct burial feeders to fixtures.

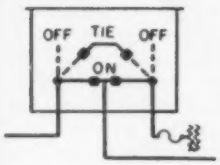
As indicated in the accompanying diagrams, methods used for fixture mounting are varied, combining wide assortments and arrangements of pipe clamps, weatherheads, bracket arms, mounting masts, wall sleeves, flashing procedures, and bolting methods.

Provide safe sectionalization for

Cable System Flexibility

with G&W load-break oil switches





"RAL" OIL SWITCHES

Type "RAL" oil switches with three ways (2 feeder and 1 load), two sets of links, and tie buses are designed for use on loop circuits and in other situations where similar flexibility would otherwise require three separate oil switches with correspondingly greater expense for equipment, installation, and space.

These oil switches materially reduce the length of time required for restoring service in case of trouble, or for isolating a circuit to make changes. Load break disconnection of a circuit is accomplished by manually operating an external lever—without opening the tank or breaking the oil and moisture seals.

Standard "RAL" oil switches in 7500 and 15000 volt ratings are now assembled from stock parts for shipment in 4 to 6 weeks. Bulletin DB51 gives complete data and prices. Write for your copy or ask your representative.

G&W ELECTRIC SPECIALTY CO.
7780 Dante Avenue, Chicago 19, Illinois, U.S.A.
Representatives in principal cities of U.S.A.
In Canada—Powerlite Devices, Ltd., Toronto, Montreal & Vancouver

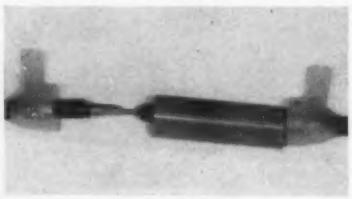
D5218

Plastic Jacket Cable Splicing

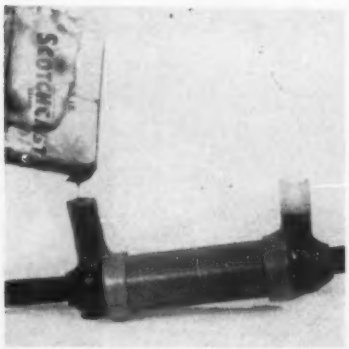
WIRING

A new splicing and insulating method has been introduced to provide factory-perfect cable splices under field conditions. Developed by Minnesota Mining and Manufacturing Co., a convenient kit is available containing all of the necessary material and equipment for making tough, plastic-jacketed cable splices in from 10 to 20 minutes. The splices are completely protected and insulated against moisture, corrosion and electrical leakage.

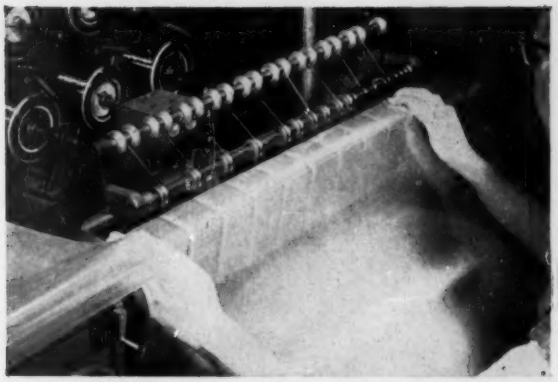
The new method involves embedding the splice in liquid epoxy resin that hardens into a hermetically sealed casting. No heat is required. Basis for the method is "Scotchcast"—an electrical embedment resin now available in a plastic mixing envelope which provides a virtually foolproof method for mixing resin and hardener in the right proportions. Previously, industry's use of this type of resin—with its high dielectric strength, excellent ad-



THREE MOLD PIECES are slipped on the ends of the wire, the insulation penciled down and a spring connector finger-turned on the wire ends to splice them together. The mold pieces are then pulled together, with the wire joint in the middle of the tubular mold piece and the ends of the tubular piece tucked into the end molds.



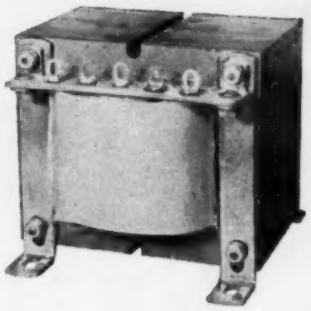
ACTIVATED RESIN is poured into one of the spouts from a small hole torn in the corner of the plastic container, after properly preparing the resin. Preparation consists of first squeezing the container to rupture an inner partition which separates the resin from the hardener, and then kneading the contents to properly mix the two. When the mixture is uniform in color, it is ready to pour.



Operator of a Universal winding machine using Natvar Silicone-Coated Fiberglas for interwinding and layer insulation of a Freed multiple wound class H transformer.

FREED CLASS H TRANSFORMERS

are insulated with NATVAR Silicone-Coated FIBERGLAS



In spite of its weight, only 23 lbs., this class H unit delivers 2 kva. A unit of the same size with class A insulation would have an output of only 0.3 kva. Interwinding, interlayer and outside wrapper are of Natvar Silicone-Coated Fiberglas for maximum reliability.

FREED TRANSFORMER COMPANY, pioneer in the field of radio and electronics, designs and manufactures test instruments, transformers, reactors and filters of high reliability, including an extensive line of components built to meet MIL-T-27.

One of the significant developments in military apparatus is the saving of space and weight through use of new materials which permit operation at higher temperatures with no sacrifice of reliability. For these applications, Class H insulation must be used.

Freed uses Natvar Silicone-Coated Fiberglas to insulate Class H transformers because of its consistently good electrical and physical properties. All Natvar flexible insulations are dependably uniform, no matter when or where purchased. They are available either from your wholesaler's stock or direct from our own.

NATVAR CORPORATION

FORMERLY THE NATIONAL VARNISHED PRODUCTS CORPORATION

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CABLE ADDRESS NATVAR: RAHWAY, N. J.

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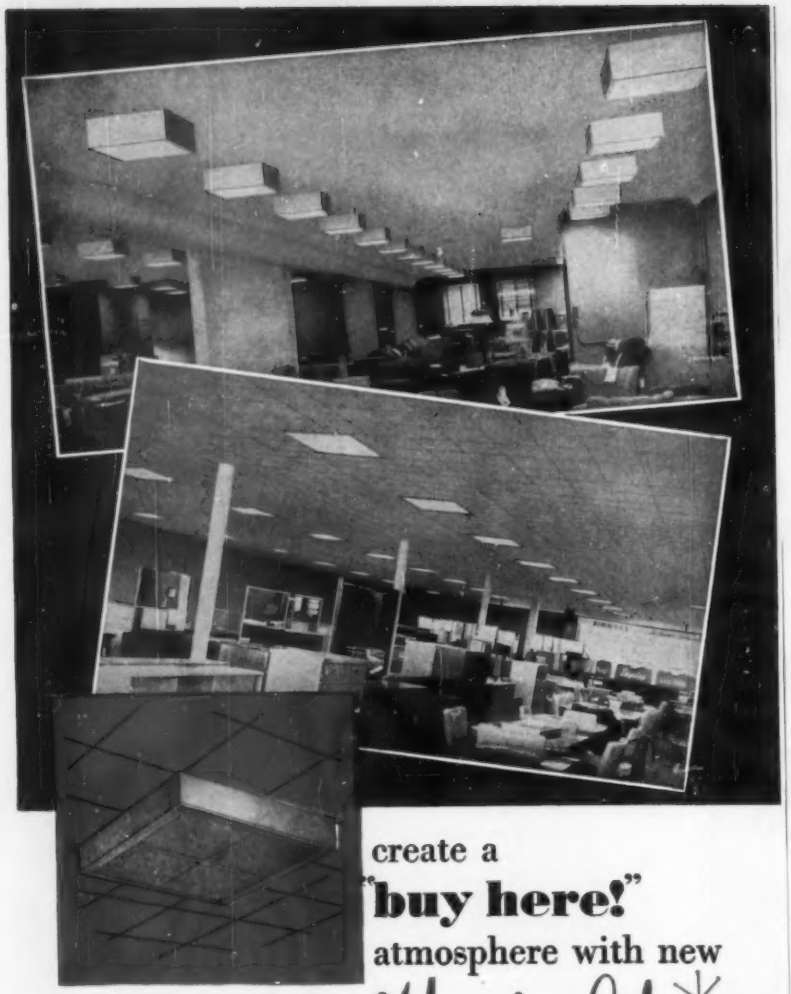
Natvar

Natvar Products

- Varnished cambric—cloth and tape
- Varnished canvas and duck
- Varnished silk and special rayon
- Varnished—Silicone coated Fiberglas
- Varnished papers—rope and kraft
- Slot cell combinations, Aboglas®
- Varnished-lacquered tubing and sleeving
- Extruded vinyl tubing and tape
- Styroflex® flexible polystyrene tape
- Extruded identification markers

Ask for Catalog No. 22



create a
"buy here!"
atmosphere with new

Guth Magic-lite*

with GRATELITE** Louver-Diffuser

the magic combination of architectural beauty and sales-building lighting for contemporary store interiors.

GUTH MAGIC-LITE is well-shielded by a GRATELITE Louver-Diffuser. It transforms the direct light into softly flattering illumination, essential for good merchandising.

LOW ORIGINAL COST—LOW UPKEEP COST

Uses least expensive lamps—GrateLite Louvers are cleaned in 2 minutes.

VERSATILE

Mount singly or in patterns. Recess or surface. 24" or 12" square sizes.

May we send you our new Magic-lite Catalog 901-A?

*Trademark
**U.S. & Can. Pats. Pend. Trademark Registered

THE EDWIN F. GUTH CO. ST. LOUIS 3, MO.
Leaders in Lighting since 1902

CROSS-SECTION of a completed splice shows the wire ends with the spring connector and the heavy plastic jacket. The resin sets up within 5 to 15 minutes, depending upon temperature, and the plastic tubular mold is left in place for added strength. The completed splice is resistant to water, oil, solvents and weathering. For underground runs, backfilling may begin immediately after the resin is poured.

hesion and resistance to moisture—has been limited to the controlled conditions of the manufacturer's plant where it has been used for embedding coils and other electrical components.

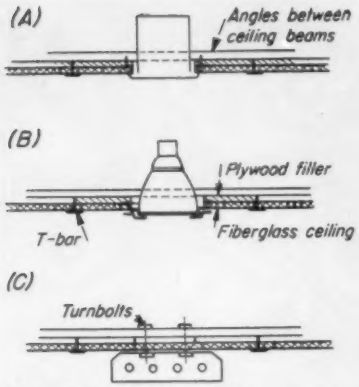
To date, application of this new splicing method include: street and airport lighting cable, communication cable and splices in insulated conductors above ground and underground, and completely submerged conductors. Splices can be made on single conductor cable from sizes No. 10 to No. 4.

Each splice kit makes one complete splice and includes: "Scotchcast" resin in the plastic container, a three-piece vinyl plastic single-use mold, two different-sized electrical spring connectors, a strip of abrasive cloth for cleaning the conductors and an instruction sheet. The accompanying photos point up the technique of making this splice. A pocket-knife is the only tool required.

Plywood Fillers Improve Fixture Mounting in Suspended Ceilings

LIGHTING

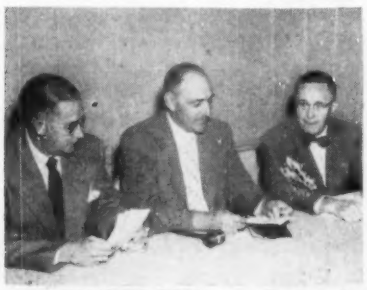
When Friedman Electric of Boston recently renovated the Star Supermarket in Cambridge, Mass., they found that the lighting plans called for the installation of numerous fixtures in the suspended Fiberglas ceiling, although the method of mounting the units was not specified. Fixtures were both recessed and surface mounted, lensed and louvered, and many of the locations were in the centers of acoustical panels, with no solid backing behind the panels to provide the fixtures with firm support.



PLYWOOD FILLER STRIPS are placed around recessed lighting fixtures and above surface-mounted units in order to build up thickness of suspended Fiberglas ceiling to equal the depth of the supporting T-bar framework. Fixtures can then be supported by bridging angle irons, and supporting fixture bolts can be tightened without danger of deforming the Fiberglas panels.

Friedman therefore decided to run angle bars across the tops of the adjacent ceiling-supporting T-bars and to attach the fixtures to these angles. Since the T-bar framework was supported from the ceiling by closely-spaced hanger rods, this angle bridging method proved highly satisfactory. It was noted, however, that the Fiberglas ceiling panels were of less depth than the supporting tees, so slight gaps remained between the upper surface of the ceiling and the lower surfaces of the bridging angles. This gap was not serious, except that it was impossible to draw up the fixture-supporting bolts tightly without warping the edges of the Fiberglas sheets.

This second problem was solved by cutting plywood filler strips or collars, inserting these filler sheets between ceiling panels and bridging angles. Then, with the built-up thickness of the ceiling equal to the depth of the T-bars, bolts could be tightened without deforming the panels.



NEW OFFICERS OF Western Section, International Association of Electrical Inspectors, are (L to R): 1st vice president —Glenn Rowell, Minneapolis; president —J. E. Fisher, Elkhart, Ind.; secretary-treas.—H. L. Parks, Charleston, W. Va.

ANNOUNCING THE NEW

HUBBELL 20 amp. AC Topper Switch

alternating current

Now available in both 15 and 20-amp. ratings.

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Catalog No. 1221

Meets the need for a quiet, yet dependable, long-life AC switch to withstand the inductive load characteristics of fluorescent systems.

QUIET operation

Note red top for easy identification of Topper 20-amp.

ONLY HUBBELL TOPPER SWITCHES COMBINE ALL THESE FEATURES

- Shallow size *Topper switches are shallower—take up less room*
- Quiet operation (without mercury)
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- Operates in any position
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- Back and side wiring utility
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A Switch Designed for the Purpose

. . . to control large inductive circuits at full rated capacity. This means that amp. for amp. Topper controls more fluorescent fixtures than outmoded switches. It also means that larger areas can be controlled with one switch, and that heavier circuits can be run and fewer of them, resulting in lower material and labor costs.

Write today for free Topper folder.

TOPPER AC SWITCHES		
	15-AMP.	20-AMP.
S P single pole	1201	1221
D P double pole	1202	1222
3 W 3-way	1203	1223
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Available in brown and ivory.

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Highest Grade HEAVY DUTY WIRING HUBBELL DEVICES

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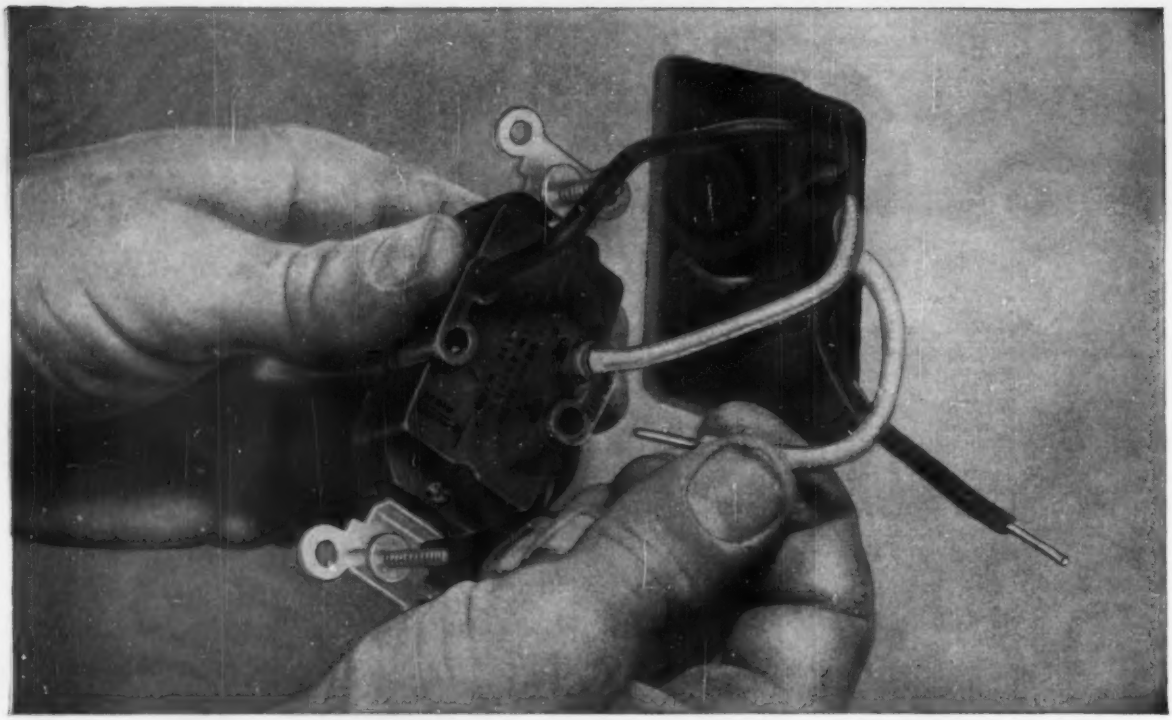

IT'S EASY TO WIRE GE3800-LINE DEVICES WITH EITHER NO. 10 OR NO. 12 AWG WIRES

GE3800-line outlets, switches and lampholders have G-E pressure-lock terminals. This means: no binding screws to loosen or tighten—no chance of destroying the device by stripping or mangling binding screws—and no need to loop or bend wires when you install these devices. Just strip off the insulation, push the wire into the terminal openings, and the G-E pressure-lock terminal grips the wire for a firm, dependable connection.

Cutaway view of GE3800-line outlet

Ask your G-E Construction Materials distributor to demonstrate these new devices

You'll see immediately how G-E pressure-lock terminals solve device problems caused by the heavier wire requirements of new installations and circuit modernization jobs.

Here's how GE3800-line devices work: Sturdy, corrosion-resistant locking springs hold the *entire* stripped length of the wires securely inside contact channels. These connections withstand a pull-out test of over 75 pounds with No. 14 Awg wire. Equally firm, positive connections are made with No. 12 and No. 10 Awg solid-conductor wire as well as No. 14 and No. 12 Awg stranded wire. All live parts are *completely* enclosed—hazards of shocks and short circuits are avoided. Vibration won't loosen connections—yet, when necessary, wires can be removed by inserting a screwdriver into release slots.

GE3800-line outlets and switches with pressure-lock terminals are available in both standard and intermediate grades. All GE3800-line devices are listed by Underwriters' Laboratories, Inc. and meet Federal Specifications.

For a free folder on this new wiring development write Section **D121A-1218**. Construction Materials Division, General Electric Company, Bridgeport 2, Connecticut.

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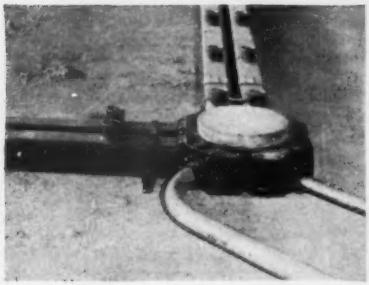
Product News



Underfloor Raceway (1)

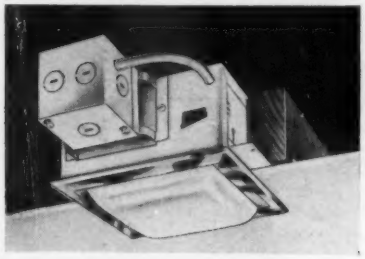
A new industrial type of Nepcoduct underfloor electrical raceway has been announced. A rugged, 14-gauge cold rolled steel raceway with a 4-in. by 4-in. cross section, it is designed for heavy-duty wiring in industrial plants where overhead wiring would interfere with normal operations. The new Nepcoduct's greater capacity allows flexibility in plant layout. It is galvanized by the Sherardizing process and is further protected with an acid-resistant clear enamel on interior and exterior. Industrial Nepcoduct is furnished in standard 10-ft lengths and provides 2-in. pipe size, threaded outlets on 24-in. centers, permitting direct insertion of conduit for stand-pipe service fittings. Complete with junction boxes and a full complement of fittings, it is a fully grounded, industrial underfloor wiring system, and is listed by UL.

National Electric Products Corp., Gateway Center, Pittsburgh, Pa.

Explosion-Proof Motor (2)

Explosion-proof Tri-Clad "55" motors, featuring extra protection for hazardous location applications, have been announced. Available in ratings from 1- to 5-hp, they are especially designed for safe applications in classified atmospheres containing flammable gases or combustible dusts. The new motor has heavier frame and end shield castings, and a special, machined-fit conduit box secured to frame with four bolts. End shields are fastened to frame with external bolts to avoid a flame path to interior of motor. The cooling fan is made of a special Textolite plastic. These motors can be used in atmospheres containing metal dusts, magnesium, and aluminum. The classes covered under the NEC are: Class I, Group D; and Class II, Groups E, F, and G.

General Electric Co., Schenectady 5, N. Y.



Incandescent Box (3)

A new incandescent, recessed lighting fixture has been developed for residential applications. This unit is a 100-watt incandescent box of square cross section, available either prewired or unwired. The housing has a baked white enamel finish, a hinged frame for the diffusing medium and a side-mounted outlet box with KO's and removable plates for access to the circuit wires. Chrome finish is standard for the unit; however, aluminum, brass, copper and gray or white baked-enamel finishes are also available. The diffuser may be flat Alba glass, pattern glass, drop opal glass or a Fresnel lens.

Prescolite Mfg. Corp., Box 188 Station A, 2229 Fourth St., Berkeley, Calif.

Clamp (4)

New snap on clamp features indentation above bend between base of clamp and conduit support area; allows clamp to be snapped onto conduit, freeing both hands for work. This clamp has been engineered to provide proper relationship between these factors: location of indentation; length of conduit support area; length of base. Material for the ½-in. and ¾-in. sizes now available is 13 gauge (.090-in.) x ¾-in., for adequate strength.

Midwest Electric Manufacturing Co., 1639 W. Walnut St., Chicago 12, Ill.

Motor (5)

A rib-type enclosed, fan-cooled wound-rotor motor made with slip rings, brush rigging, rotor and stator all inside a single frame enclosure has been announced. Unit is available at 1800 rpm and slower speeds, in frames 284 to 505, in standard enclosed or explosion-proof construction. The motor is applicable where very low starting current, high starting torque, smooth acceleration, jogging or variable adjustable speed dictate the use of a wound-rotor motor and where moist, dirty, corrosive, or hazardous atmospheres require a totally enclosed motor. The frame of motor has an extended front end to include slip rings, brushes and brush rigging in one enclosure. Leaflet 51R8195 is available.

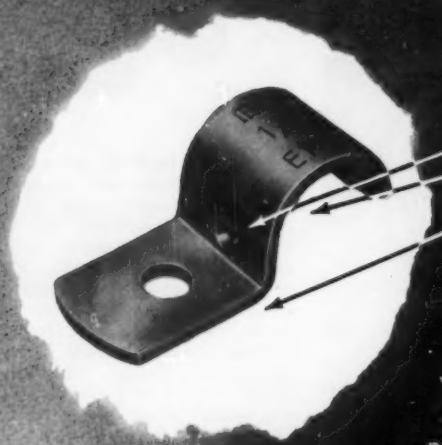
Allis-Chalmers Manufacturing Co., Milwaukee 1, Wis.

Troffer (6)

Magic Frame troffer can be easily inserted and maintained without the use of tools. Exclusive "Speedy Latches" in wireway channel provides simple handling. All electrical components are contained on a removable chained cover, and door is installed and removed by lifting and shifting. Other features are bottom door hinges on a concealed pivot; bottom door locks in position by concealed retainer; door is interchangeable into any other Magic Frame fixture. Each troffer can be furnished with a "Lite Gard" fusetron fuse to protect against thermal and electrical overload. Troffer is available with all types of flat glass and plastic diffusers as Alba-Lite, Fota-Lite, Crysta-Lite, Twin-lens, and P4 Diamond Pattern Plexiglas. Slimline, rapid start fluorescent, and standard fluorescent, 2-ft, 4-ft, 5-ft, and 8-ft lengths with one, two and three lamps.

Electro Silv-A-King Corp., 1535 S. Paulina St., Chicago 8, Ill.

NEW midwest SNAP ON CLAMP



ENGINEERING

This new clamp has been carefully engineered to provide proper relationship between these factors:

★ *Location of the indentation*

★ *Length of the conduit support area*

★ *Length of the base*

SNAP ON ACTION

Snap action indentation holds clamp firmly to conduit; frees both hands for work.

MATERIAL

Material is 13 gauge (.090") x ¾"; this provides completely adequate strength.

FABRICATION

Extra care with the production dies provides a cleanly stamped, burr-free clamp. Clamp is thoroughly cadmium plated for protection against corrosion.

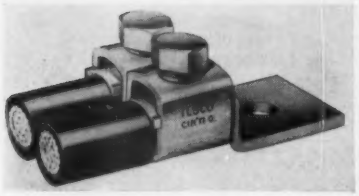
• Here is another Midwest development in providing quality fittings. "Quality" is just a condensed way of saying: "Getting the total job done — right — with the most inexpensive combination of material and man hours." Engineering and producing quality fittings to meet the highest standards of electrical wiring installations is our objective at Midwest.

Midwest Electric Mfg. Company

MANUFACTURERS OF ELECTRICAL WIRING PRODUCTS

1639 W. WALNUT STREET

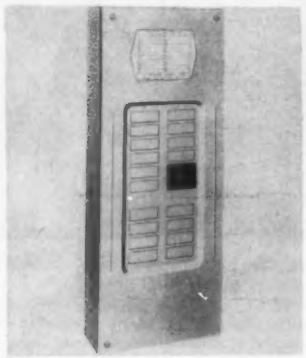
Chicago 12, Illinois



Connectors (7)

LU-2 multiple lug is now available with a wire range for two 4/0 to two 1/0 cable in addition to LU-4 and LU-6 multiple solderless lugs. The compact design permits the two cables to be installed in the space ordinarily required for one larger cable. Wires are wedged between arched pressure bar and V-bottom collar. This establishes a grip on the conductors with positive contact assured at all times. It is simple in design and solderless connections are made quickly with socket wrench.

Ilsco Copper Tube & Products, Inc., Cincinnati 27, Ohio



Service Equipment (8)

Split-bus service equipment provides capacity for electric ranges, water heaters, dryers, air conditioners, etc., and subfeeder circuit to additional centers of distribution. The new units are of the "enclosed panel base assembly" type and are approved by U. L. for label service. They have 100- or 200-amp, main lug feeder capacity for single phase, solid neutral service. Each is furnished with one service connection having a double pole 50-amp circuit breaker with wire connection to the lighting and appliance branch circuit section.

Frank Adam Electric Company, P. O. Box 357, Main Post Office, St. Louis 3, Mo.

Fuse Cutouts (9)

A new line of enclosed fuse cutouts with all operating functions available in one basic design. Flexibility of application of the new line is accomplished with one housing and four interchangeable doors in each voltage and current rating. The choice of doors provide for normal duty indicating or dropout, normal duty indicating non-dropout, indicating heavy duty or extra heavy duty, and disconnect functions. The new cutouts, which help provide distribution system and apparatus protection against short circuits and overloads, are currently available in voltage ratings of 5.2 kv and 7.8 kv, in continuous current ratings of 50 amps and in all applicable NEMA standard interrupting current ratings. The 100-amp cutouts in 5.2 kv and 7.8 kv ratings, with the same features as the 50-amp line, will be available early in 1955.

General Electric Co., Schenectady 5, N. Y.

Pipe and Cable Layer (10)

New pipe and cable layer is specially designed to install flexible pipe and cable underground at low cost. This new tool quickly attaches to the Ferguson tractor, and will put flexible piping up to 1½-in. in diameter into the ground up to 18-in. deep in a matter of minutes. Actually the pipe and cable layer is an agricultural "sub-soiler" to which is added a guide tube for conducting pipe or cable into the bottom of the cut; guide rings are mounted on tractor for conducting pipe or cable back to guide tube. Features are: handles flexible pipe ½-in. to 1½-in. in diameter, and heavy duty electrical cable; installs pipe or cable up to 18-in. deep; adjustable roller bracket on base keeps pipe or cable on bottom of slit for maximum depth; leaves ground level.

Ferguson Division, Massey-Harris-Ferguson, Inc., 1721 Packard Ave., Racine, Wis.

Automatic Transfer (11)

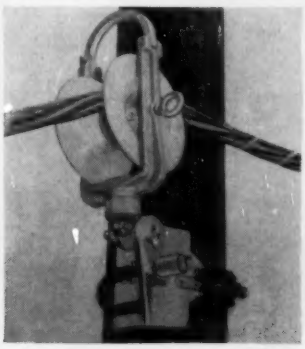
A new automatic transfer mechanism for use with oil switches, either double throw or two single throw units, supply load from either of two feeders. The mechanism automatically transfers the load from "preferred" feeder to "emergency" feeder when "preferred" feeder voltage fails. It throws back automatically when "preferred" feeder voltage is restored. Model "F" mechanism is a watertight sealed housing. The mechanism unit is mounted on the steel supporting frame of Type "RA" oil switches in 5000-, 7500- and 15,000-volt ratings. Bulletin No. DA-F is available.

G&W Electric Specialty Company, 7780 Dante Avenue, Chicago 19, Ill.

Power Reel (12)

A new Spring-O-Matic Powereel simplifies and speeds up payout and take-up of electrical supply cables on hoists, cranes and other mobile electrical equipment. Available in gray enamel finish, unit is a heavy duty cable reel with a retractable spring, easily adapting itself to all types of mobile electrical equipment and protecting cables from tangling and unnecessary wear. Both a plain and pivot base are available. The pivot base allows the reel to swivel over an arc of 330 degrees on self-lubricating bearings. Unit weighs 25 pounds, and operation is based on 30-amp, 600 vac, 300 vdc, 1 to 8 collector rings.

Industrial Electrical Works, 1503 Chicago St., Omaha, Neb.



Cable Pulley (13)

A new aluminum alloy pulley designed to allow the lineman, at the first attempt, to properly position it on the pole by hand, before securing with a wrench. Known as the Tey Aerial Cable Pulley, the unit weighs less than 25 pounds. Flexibility in the horizontal and vertical planes enables the sheave to be aligned closely to the pole in order to attach the messenger directly to the pole without the use of jacks or auxiliary equipment. Designed for a recommended cable load of 600 pounds, while requiring only eight inches of pole length, it may be mounted on the pole for cable attachments to the crossarm. Construction includes roller bearings, safety bar and deeply grooved sheave for safe operation and a finger-tip snap latch on the safety bar for easy cable release.

Tey Manufacturing Corp., Milford, Conn.

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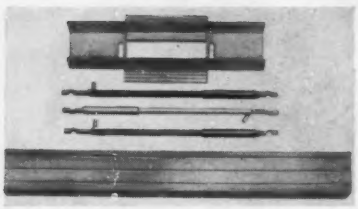
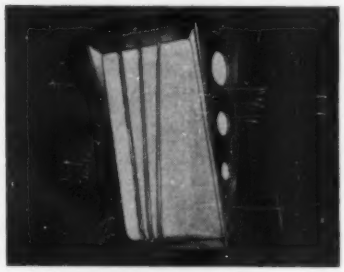


Fitting **(14)**

Switch-controlled multi-outlet Plug-in Strip can now be mounted directly to outlet boxes with a new fitting, designated as CF3-629. The new outlet box cover comes furnished with three splicing jumpers and insulator tubes ready for crimp-on connection to Plug-in strip. It was developed for use as a cover plate on device and outlet box feed installations when using Type CF3 switch controlled Plug-in Strip. It is listed by U. L.

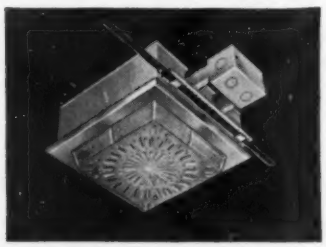
National Electric Products Corp., Gateway Center, Pittsburgh, Pa.



Outdoor Luminaires **(15)**

A new line of outdoor incandescent lighting fixtures is now available for residential and some commercial applications. Included in the eight styles are units which will blend with contemporary or traditional architecture, for modern or split-level homes, Cape Cod cottages and ranch dwellings. Units may be used at doorways, porches, steps, pathways and some may even be used inside the house. Both glass and metal diffusers and shielding are used in the new fixtures.

Lightolier, Inc., 346 Claremont Ave., Jersey City 5, N. J.

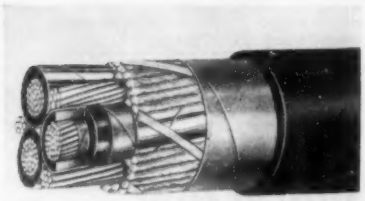


Recessed Boxes **(16)**

A new line of pre-wired and unwired "Lumi-Dome" recessed boxes, with new patented "Time-Saver" pre-wired junction box, which reduces installation time. Removal of a single screw permits complete assembly to be pulled into box where

there is comfortable, visible working space. "Time-Saver" comes equipped with 9-in. A.F. leads and 6 knockouts. "Spring-Lok" frame hinge requires no screws. For installation and relamping, hinge pulls down from either side providing full access to interior. Frame-and-glass sets, in five popular finishes and seven new glass styles, are completely interchangeable between wired and unwired boxes of each of the four sizes. Easy to mount in any type of ceiling, the "Lumi-Dome" box is equipped with a "Lite-Seal" gasket that prevents light leakage, as well as plaster flange, pre-set for standard plastering, but adjustable to any depth.

Markstone Manufacturing Co., 2460 W. George St., Chicago 18, Ill.



Cable (17)

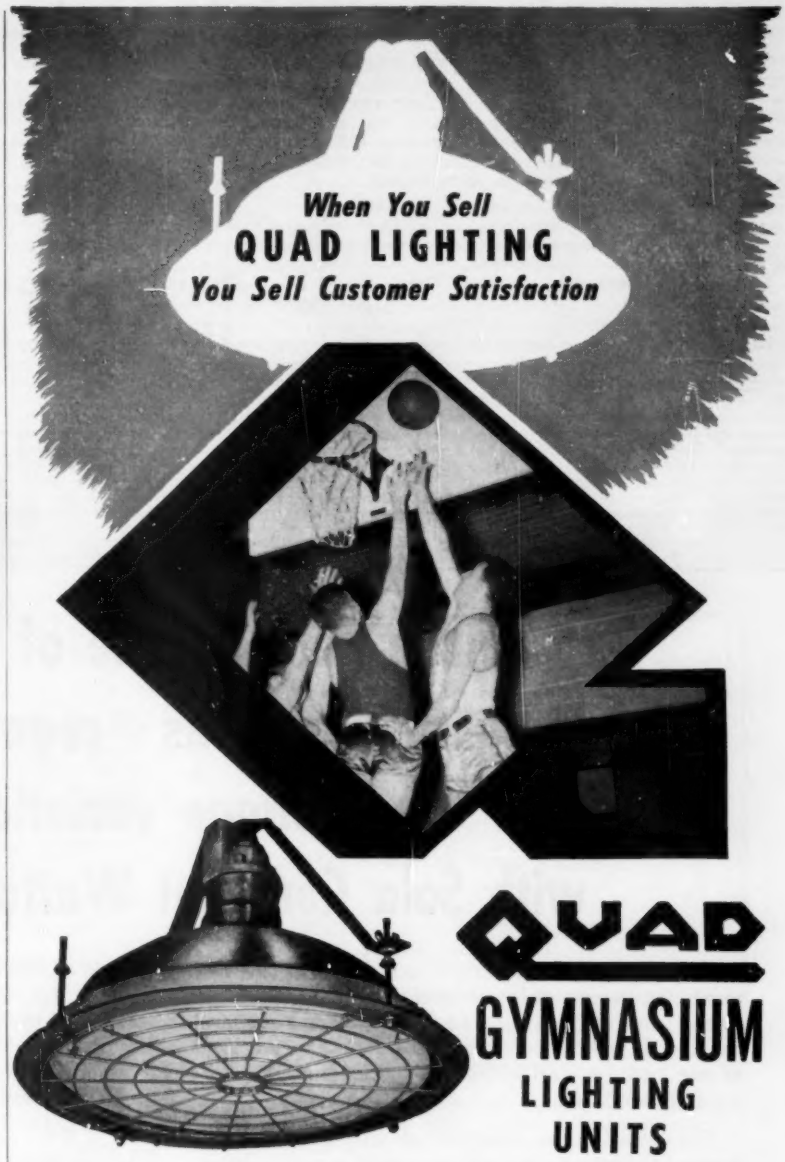
A new type of non-metallic sheathed cable designed especially for 5000-volt power feeder service. Through the use of Polyethylene insulating compound, and a Polyvinyl-Chloride sheath, this cable has a smaller diameter and is lighter in weight than similar cables of equivalent capacity. These compounds provide resistance to chemicals, moisture and to mechanical damage and wear. Cable has three conductors, each individually shielded throughout its entire length with a metallic shielding. Cable is suitable for installation in boreholes, shafts, horizontal runs in underground entries, aerial suspension on insulators and many other mining and industrial applications. Cable is available in sizes ranging from No. 6 AWG to 250 MCM. The No. 6, with a rated capacity of 72 amps, is 1.22-in. in diameter. The 250 MCM is 2.21-in. in diameter, is rated at 271 amps.

Rome Cable Corporation, Rome, N. Y.

Wiring Devices (18)

A new line of heavy duty, plastic-incased wiring devices, called Lev-O-Lets, for all types of surface wiring installations. All units in this line, including a single pole switch, 3-way switches, duplex receptacle, pull chain lampholder, keyless lampholder and junction box are listed by Underwriters' Laboratories and Canadian Standards Association and meet REA and Federal Specifications. They have bus bars for 3-wire connections or thru feed connections, multiple knockouts for various wiring combinations and large wire terminals for loop or clamp connections.

Leviton Manufacturing Company, Inc., 236 Greenpoint Ave., Brooklyn, 22, N. Y.



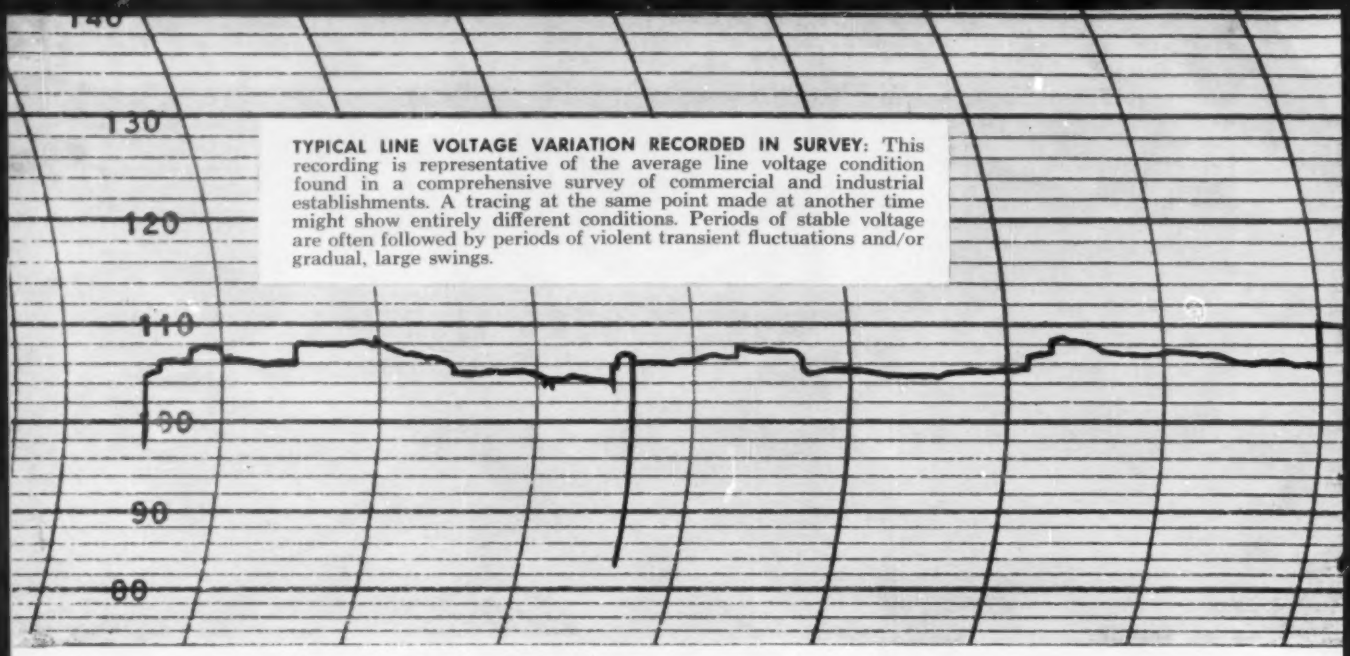
QUAD
GYMNASIUM
LIGHTING
UNITS

• Here is a specially designed unit combining lighting efficiency with the ability to withstand shocks and rough treatment. Flush mounted, this unit is ideal for installation in many types of modern construction where suspended ceilings are used.

The QUAD Gymnasium Lighting Unit has all of the features that make customers and profit. Installations have been made in various parts of the country, for combined gym and assembly halls, rinks, armories, and indoor arenas.

It is serviced from above or below ceiling — has detachable porcelain enameled reflector—angle iron plaster ring—is adjustable for variable ceiling thicknesses — has heavy wire guard and a dust tight glass cover is optional.

QUADRANGLE MFG. CO.
325 S. PEORIA ST. CHICAGO 7, ILL.



TYPICAL LINE VOLTAGE VARIATION RECORDED IN SURVEY: This recording is representative of the average line voltage condition found in a comprehensive survey of commercial and industrial establishments. A tracing at the same point made at another time might show entirely different conditions. Periods of stable voltage are often followed by periods of violent transient fluctuations and/or gradual, large swings.

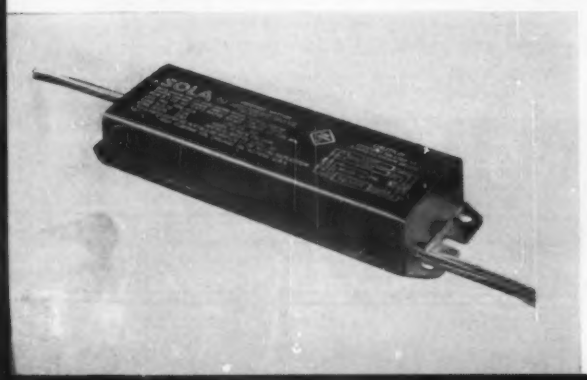
Stabilize performance of fluorescent lighting systems—regardless of line voltage variations—with Sola Constant Wattage Ballasts

Greater line voltage variations at point-of-use may exist than is generally appreciated. This condition arises from the constant and ever-growing demand for electric power, increasing size of loads to be served at one location, and increasing inadequacy of users' wiring installations.

This substantial variation of voltage is usually beyond the control of the commercial power utilities. Their voltage is carefully controlled at the point of distribution; and it is the starting and stopping of heavy loads near the point of use, which usually causes the trouble.

These line voltage variations have definite adverse effects on fluorescent lighting performance when systems are ballasted with conventional, non-regulating transformers. But Sola *Constant Wattage* Ballasts provide stabilized conditions regardless of typical line voltage fluctuations. Three major areas of lighting system performance under fluctuating line voltage conditions are compared in the following three points:

1. *The level of illumination specified at a particular working surface will drop when line voltage drops.* Sola Constant Wattage Ballasts maintain lumen output constant in face of line voltage drops. You get all the light your system was designed for.
2. *Lamp life is shortened by line voltage surges.* Sola

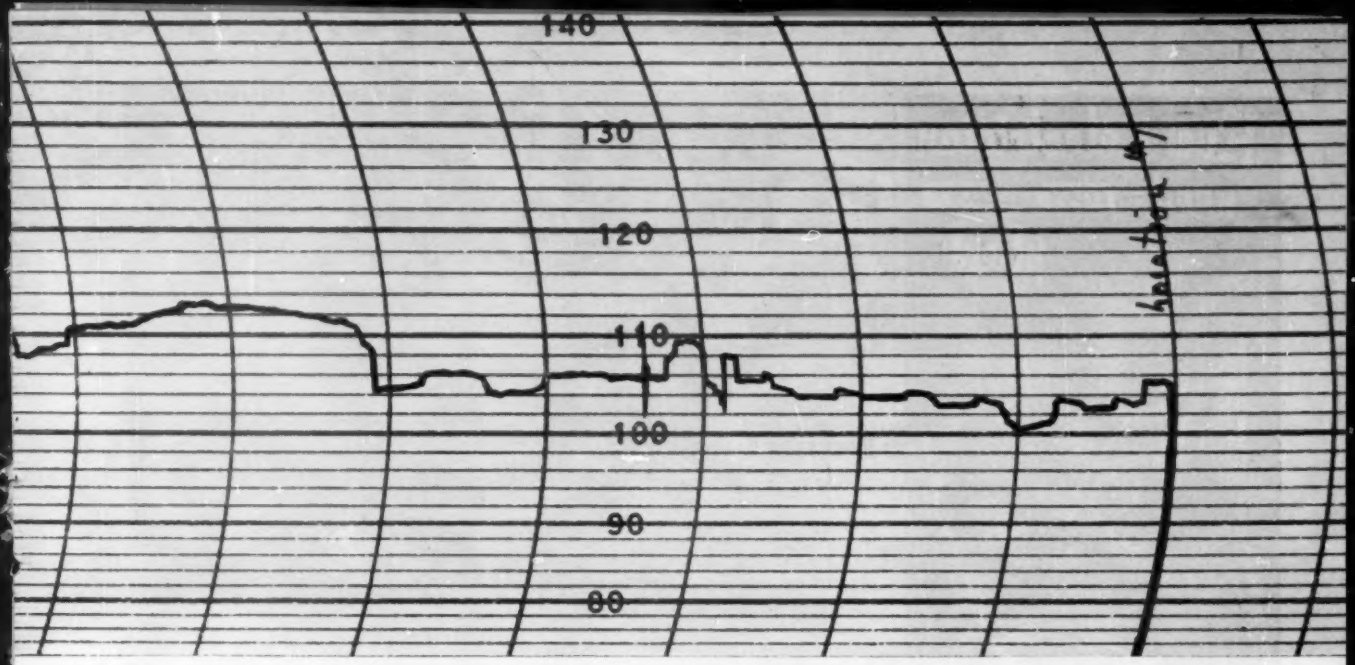


HOT CATHODE BALLASTS

RAPID-START LAMP BALLASTS: For 2-T12, 40w rapid-start lamps. Series-sequence operation, peak/rms ratio approx. 1.5 at 118v. Lumen output held constant to within ±2% or less, in face of line voltage variations as great as 10%. 300v from electrode to ground for reliable starting. Case height only 1-13/16". Low temperature rise, quiet in operation.

COLD CATHODE BALLASTS

HIGH or LOW PRESSURE COLD CATHODE LAMP BALLASTS: For 93 inch, 25mm. diameter cold cathode lamps. High power factor, close to unity at all times, even though one lamp is inoperative on a two-lamp parallel ballast. Pressed-in core and coil construction. Lumen output varies less than ±2.5% with primary voltage variations as much as ±15%. Light weight, compact.



Constant Wattage Ballasts automatically control lamp current within a safe value. You get lamp life over and above what you pay for.

3. *Overall operating efficiency is lowered by line voltage fluctuations.* Sola Constant Wattage Ballasts continuously deliver regulated energy to lamp electrodes which results in: positive starting, cool operation, and self-protection against damaging ballast heat rise when lamps fail. Stabilized operation of fluorescent lighting systems reduces maintenance time and cost—results in dependable operation. You get all the service you pay for.

The major types of Sola Constant Wattage Ballasts are shown across the bottom of these pages. For more information, please write or phone for a Sola sales engineer. He will give you further help in adapting Sola Constant Wattage Ballasts to any new or revamped lighting installation you are considering.

SOLA *Constant Wattage* **BALLASTS**

SOLA ELECTRIC CO.

4633 W. 16th St., Chicago 50

Branch offices and representatives in principal cities

Write for any of the following bulletins, giving complete electrical and mechanical specifications.

RAPID START BALLASTS,
Bulletin 17L—FL-199

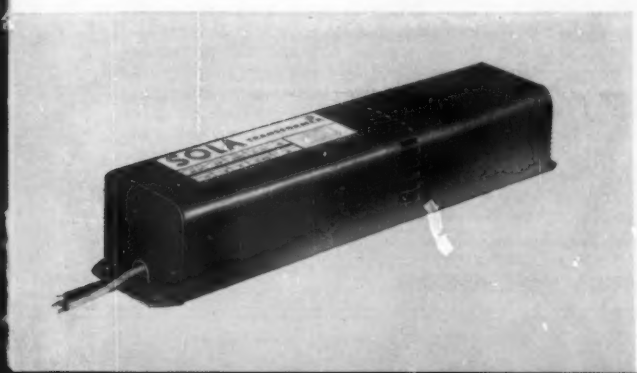
COLD CATHODE BALLASTS,
Bulletin 17L—PFL-152

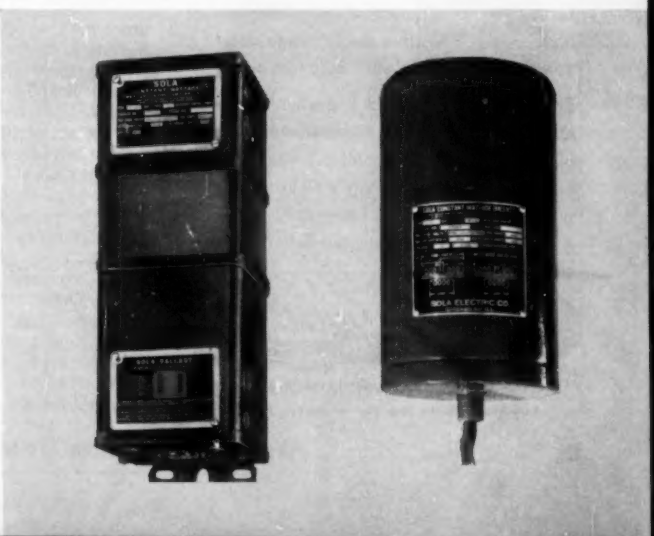
OUTDOOR MERCURY VAPOR BALLASTS,
Bulletin 17L—MV-208

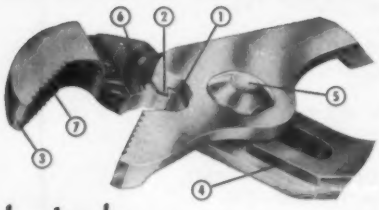
INDOOR MERCURY VAPOR BALLASTS,
Bulletin 17L—MV-211

MERCURY VAPOR LAMP TRANSFORMERS

OUTDOOR AND INDOOR MERCURY VAPOR LAMP BALLASTS: Outdoor weather-proof unit (right) for commercial and industrial applications. Indoor design shown at left. Both maintain lumen output within ±2% against line voltage variations as great as 25%. Primary taps eliminated, low starting current surge, no extinguishing on line voltage dips, open and short circuit protection.







here's why

1. Interlocking principle prevents slipping under any load. **2.** New type wide base lugs cannot shear. **3.** New nose design for gripping small objects. **4.** Patented design of tension edge eliminates stress concentration at channels. **5.** Interlocking design minimizes stress on joint bolt. **6.** Precision machined interlocking surfaces result in perfect fit, distributing pressure evenly. **7.** "Rite Angle" teeth guarantee maximum bite and minimum wear.

Look for the Channellock line when you're shopping for hand tools. Channellock pliers offer features that you can't get with other makes. And when you buy a Channellock plier, ask to see the full line—you'll find a style and model to do any job better.

THE PLIER DESIGN THAT OBSOLETES ALL OTHERS

CHAMPION DuRMENT TOOL CO. • MEADVILLE, PA.

Packaged Components (19)

Square D is now packaging motor starter modification and replacement components. Standard motor starter become more flexible since modification is simplified through easy identification and availability of needed parts. Cover mounted pushbutton is typical. Other packaged components include selector switches, interlocks, overload relays, coils and repair parts. Pushbutton and selector switch kits are furnished complete with control unit, hardware and instructions for mounting in starter cover. Kits for front mounting of extra electrical interlocks are also a complete package consisting of the interlock unit, mounting hardware and instruction. Normally-open, normally-closed or double circuit, normally-open and normally-closed interlocks can be added to a standard starter to meet almost every special requirement.

Square D Company, 6060 Rivard St., Detroit 11, *Mich.*

Distribution System (20)

Powerduct, a new underfloor distribution system, offers built-in flexibility for industrial power needs. It is furnished in 10-ft lengths and is installed with junction boxes, couplings, and self leveling supports on form, slab, or fill prior to pouring the finished floor. In many cases Powerduct can be installed to modernize existing buildings. Pre-set inserts in the duct provide evenly spaced outlet points for standard connections to machines or equipment. Duct has 17 sq. in. cross sectional area, and will accommodate cables up to 500,000 cir. mils. Other features include 14 gauge steel construction, electric welded seam, and corrosion protection provided by a layer of Sherardized zinc, covered with Dualcote. Literature is available.

Walker Brothers, Conshohocken, Pa.

Cutters (21)

Utica-Smith pocket armor-cutters cut BX and BXL, No. 12 and 14-⅜ wire conductor without danger to insulation. They are 7 inches in length and weigh 8 oz. Although not designed to cut iron or steel wire, metal lath and any light flat metal is easily cut. The cutters are also equipped with a special feature for crimping over-lap of armor down to place.

Utica Drop Forge & Tool Corp., Utica 4, *N. Y.*

Service Bodies (22)

A completely new line of service bodies has been introduced. The line offers models to fit 40 different Chevrolet, Ford, Dodge, Studebaker, GMC and International Chassis, ½, ¾, 1 and 1½-tons, single or dual wheel. Features are bonderized, all-steel welded construction with double lap-type joints; 18 different compartment arrangements; extra-large compartments which are lockable with all doors keyed alike; completely weatherproof compartments; 25 to 35 sq ft of floor loading area; hinged fender panels for easy access to wheels and spring shackles.

Morrison Steel Products, Inc., 601 Amherst St., Buffalo 7, *N. Y.*

Vaportight Fixtures (23)

A new line of vaportight incandescent lighting fixtures is available for pendent, wall, surface and outlet box mounting. All metal parts are heavy duty cast aluminum with cork gaskets of extra thickness to provide permanent seal between splice box and fixture and between glass globe and fixture cap. Sturdy clamp-type electrically welded guards are optional. Fixtures are available for either 100 or 200 watt lamps. Units are made for indoor and outdoor application: boiler rooms, power houses, tunnels, showers, bath houses and building entrances.

Steber Manufacturing Co., Broadview, Ill.

$971 saved on Wiremold raceway installation with REMINGTON STUD DRIVER

Powder-actuated tool does 4-week fastening job in 3 days!

Only one week could be spared to install microphone stands at the Naval War College, Newport, R. I. Yet the 400 fastenings required for Wiremold raceways meant 4 weeks of drilling to set anchors. It looked hopeless until an electrical contractor with a Remington Stud Driver bid on the job.

Setting up to 5 studs a minute, the Stud Driver helped finish the installation in just 3 days! Each of the 400 studs was set in a few seconds; the raceways were anchored *permanently*. Cost, including labor, cartridges and studs was $321 compared to an estimated $1,292 for the old method. A saving of $971 or 75%!

Take advantage of the cartridge-powered Remington Stud Driver to bid lower, work faster on all sorts of installations—including switch boxes, conduit, and overhead lighting fixtures. The tool is lightweight (6 lbs.) and needs no cables or wires. You carry the power in your pocket! Clip coupon for complete information.

"If It's Remington—It's Right!"

Remington DUPONT

Listed & Approved by Underwriters' Laboratories, Inc.

TYPICAL QUESTION FROM A CONTRACTOR

Q. *Is there a way of fastening switch and outlet boxes with just one stud?*

A. *There sure is! With our new cupped washer, you can easily position and secure the box with one stud. Outlet box can be removed later if desired. We'll be glad to send you our booklet on the cupped washer.*

MAIL THIS COUPON TODAY

Industrial Sales Division, Dept. ECM-12
Remington Arms Company, Inc.
Bridgeport 2, Connecticut

Please send me free copies of your general information and Wiremold raceways booklets showing how I can cut my fastening costs.

- ☐ How to Install Wiremold Raceway
- ☐ How to Install Outlet & Utility Boxes with Cupped Washer
- ☐ Catalog and Price List

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*Position*_____

*Firm*_____

*Address*_____

*City*_____ *State*_____

marlou halo fixture

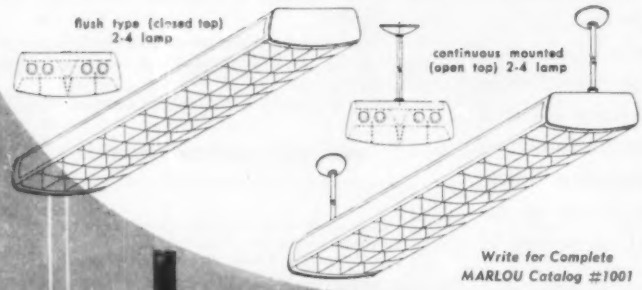
UP LIGHT = DOWN LIGHT FOR THE FINEST IN OVERALL LIGHTING

The MARLOU "Halo" louvred ceiling fixture is recognized by the government, prominent architects and engineers, when stem mounted, as producing the finest overall illumination. It corresponds to Federal #362 to #365 series, and due to its unique engineering design up light almost equals down light. *Result*—the very finest, diffused even light from one of America's best designed fixtures.

Complete installation of the MARLOU "Halo" Fixtures are being made in the Justice Department, Post Offices and many other Government departments.

Specify the "Halo" Fixture for your Job.

"Above All Else...MARLOU is Quality Lighting"



Write for Complete MARLOU Catalog #1001

marlou lights, inc.

A complete line of lighting fixtures for Fluorescent, Slimline and Cold Cathode Lights.

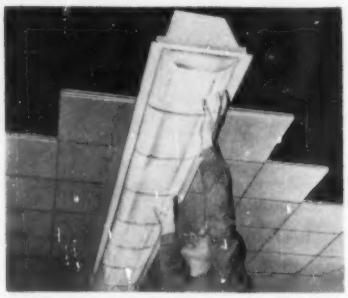
General Offices and Factory
FANWOOD, NEW JERSEY

Some select territories open to recognized Manufacturers Agents

Trolleys (24)

Two new heavy duty trolleys rated at 375 amps, 2-pole and 3-pole are now available. They are equal to the full current carrying capacity of the Feedrail "375" track. Both of the 375-amp trolleys are track supported. A mechanical polarizing stop is built in to insure proper polarity when trolleys are inserted in the track. Specially designed silver alloy brush type contacts, six per pole, assure full current carrying capacity. An insulating block of high insulating and arc-resistant properties, rigidly mounted to the chassis, provides a base for the mounting of electrical parts.

Feedrail Corporation, 125 Barclay St., New York 7, N. Y.



Troffers (25)

These new troffers permit unlimited lighting arrangements. They can be installed glass to glass to form a line of light; are adaptable to any known form of ceiling; and offer a wide selection of shielding media, including metal and plastic louvers, Corning lenses (flat and curved) Albalite glass (flat and dished), and dished Plexiglas. All are interchangeable in the LPI troffer frame. Frame is quickly and easily slipped into place and is secured by a stable floating hinge. The troffer will accommodate from one to four lamps (preheat, rapid start, and slimline). All lengths are standardized—24-in., 48-in. 72-in. and 96-in. They come in 12-in. and 24-in. widths. Literature is available.

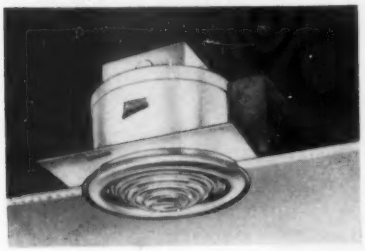
Lighting Products Inc., Highland Park, Ill.

Heaters (26)

Three new portable automatic space heaters with built-in thermostatic controls to maintain room temperatures at the comfort level are heat-powered with fully insulated, metal-sheathed tubular elements.

One of the heaters is a small 115-volt unit with a capacity of 1500 watts; larger models are 230/240-volt heaters rated at 2400 and 4800 watts. All are listed by U.L. Small model has a range-type heating element and is finished in green hammertone with polished brass finish. The built-in thermostat control is full range, has positive off position. Weight is approximately 7¼ pounds, and height is 11½ inches. Larger-capacity 2400- and 4800-watt models, finished in copper hammerloid, equipped with Microtube elements and an adjustable UL listed thermostat, 6-ft cord and molded polarized plug for plugging into 2-amp ac branch circuits. Weight is 32 pounds each.

Edwin L. Wiegand Co., 7637 Thomas Blvd., Pittsburgh 8, Pa.



Shower Fixture (27)

A new recessed incandescent, lensed fixture has been developed for use in showers. This 60-watt fixture is equipped with a circular Pyrex lens set in a square mounting plate at the base of the unit's cylindrical-shaped, baked white enamel housing. A special gasket and non-corrosive aluminum finish are provided to protect the unit in shower use.

Prescolite Mfg. Corp., Box 188 Station A, 2229 Fourth St., Berkeley, Calif.

Cable Box (28)

A newly designed 4-in. octagon cable box with a new style clamp and integral ears for "loomwire" non-metallic sheathed cable. Designated as catalog No. 2761, the box is formed of 14 gauge steel, electrogalvanized finish, is 1½ inches deep, and has ½-in. knockout and four holes in back for fixture stud and nailing. Prouts on No. 2761 box take cable sizes 14/2, 14/3, 12/2, and 12/3. In addition sides have 2-½-in. knockouts. All knockouts are flush. Specially designed NT clamps grip cables firmly in the Rededge No. 2761 box. Listed by UL, it is available also with ears, side bracket or bar hanger mounting.

National Electric Products Corp., Gateway Center, Pittsburgh, Pa.

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Take a Closer Look

at any of the products carrying the Arro Trademark and you will find that the quality of the material and workmanship is "tops" . . . so solve your drilling and anchoring problems by specifying Arro.

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See your industrial, hardware or electrical supplier

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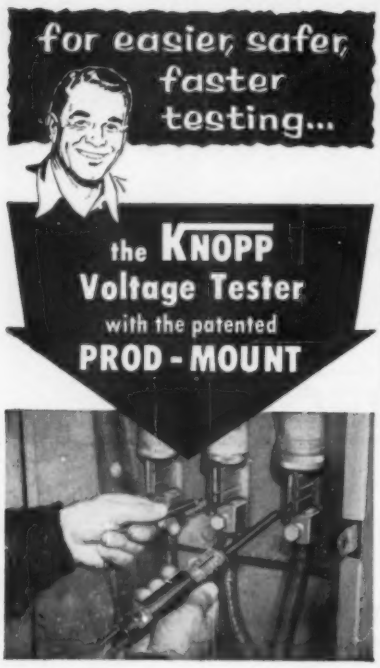
1540 Boone Ave., Marion, Ohio



has 5 Safety Features . . . many uses

When you get the pace-setting Knopp Voltage Tester you say "Goodbye to risky, time-wasting fuss in testing" because of 5 main safety features: (1) exclusive Prod-mounting Socket in housing making this tester easier, faster, and safer to use, and ending time-wasting "three-handed" testing; (2) protection through dual indication of voltage by solenoid and neon lamp working independently; (3) positive scale readings; (4) signal by hum and vibration; and (5) thorough insulation throughout, even to the sharp point of each prod.

Well-built and shock-proof in a LAMINATED Bakelite housing, the Knopp Voltage Tester tells immediately and simply if circuit is open or closed; magnitude of voltage between 110 and 600; a-c or d-c, pure or rectified; 25 or 60 cycles, for testing old and new circuits, fuses, locating grounds, etc.

Some of the nation's largest utilities, after testing all brands, use Knopp Voltage Testers by the hundreds.

Get the widely-used, reliable Knopp Voltage Tester with the exclusive, time-proved Prod-Mount, and other safety features, from your dealer, or write for illustrated, free, new, descriptive Bulletin No. 425.

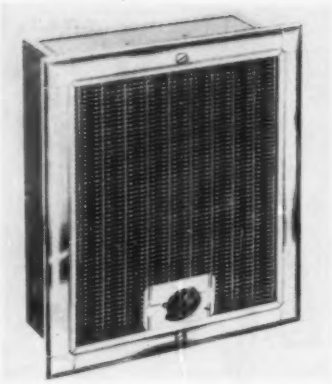
THE KNOPP Phase Sequence Indicator

60 v. to 600 v.; 25 to 60 cycles; Rotating Indicator shows sequence A-B-C or C-B-A. Light - weight. Compact. Big time saver.

KNOPP

Electrical Facilities Inc.

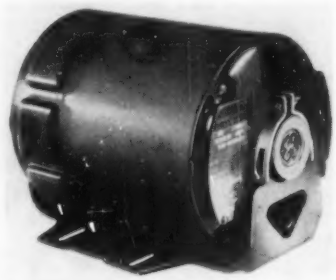
4232 HOLDEN STREET, OAKLAND 8, CALIF.



Electric Heaters (29)

Automatic heat control has been added to Broan fan-type electric heaters for bathrooms, nurseries and recreation rooms. Current models are equipped with bulb-type thermostatic control which provides automatic temperature control from 60° to 90°F. Heaters are built into the wall. A fan, behind electric heating element, draws in cold air at bottom and forces a stream of heated air out through top of grille. Model U-15 (1500-w, 5000 Btu/hr) with nickel-plated Uniflow grille, and Model S-12 (1200-w, 4000 Btu/hr) with stainless steel grille. Both come with toggle-switch or thermostatic control.

Broan Mfg. Co., Inc., 1669 N. Water St., Milwaukee 2, Wis.



FHP Motor (30)

A new totally-enclosed, split-phase fractional horsepower motor designed especially for driving light machine tools and material handling systems. New motor has a large, built-in terminal board and easily accessible base slots for simplified installation. Mounting dimensions are the same as for standard open motors of the same rating. In NEMA 48- and 56-frames, motor comes in ratings of ⅛ hp, 1140 rpm, to ⅓ hp, 3450 rpm, 60 cycles. Also available are 50 cycle models.

General Electric Co., Schenectady 5, N. Y.

Room Thermostat (31)

A new room thermostat has been designed especially for use with such electric heating installations as radiant-cable heat, radiant glass panel heat, radiant electric baseboards and rubber panels. An entirely new type sensitive element is used to obtain proper reaction to radiant heat and air temperatures. Even the color of the element and the case has been chosen to have heat absorption qualities similar to those of a human body, providing a close differential and keeping variations in heating panels to a minimum. Range of unit is from 55 to 85 degrees, with a definite "off" position marked "COLD." Electrical ratings are 2500 watts, 120 vac or 5000 watts, 240 vac.

White-Rodgers Electric Co., 1209 Cass Ave., St. Louis 6, Missouri.

Switch (32)

A new aluminum-covered pushbutton hand switch designed especially for use on punch presses and similar hand-operated equipment. Designated as 1PH1, switch is designed to fit into conventional "FS" and "FD" electrical boxes. It is 2¼-in. in diameter, and features a snap-acting spring. Switch unit has two double-break circuits—one normally open and one normally closed. A snap-action spring causes one set of contacts to break before the other set makes contact. Pilot duty rating of switch is 6 amps (normal) and 60 amps (inrush) at 125 volts ac; 3 amps normal and 30 inrush at 250 volts ac; 1.5 amps normal and 15 inrush at 480 volts ac; and 1.2 amps normal and 12 amps inrush at 600 volts ac.

Micro Switch, a division of Minneapolis-Honeywell Regulator Co., Freeport, Ill.

Swivel Fixtures (33)

Two new swivel type units have been added to the line of Utilites. One is a portable type unit for indoor use, designed primarily for complete shielding of PAR-38 and R-40 sealed beam lamps. This portable unit has weighted base and is completely wired and assembled at the factory with attachment cord set. Unit is suited to indoor dramatic color lighting of Christmas trees, holiday festive displays and other accent lighting. The other unit is made of heavy gauge steel for indoor or outdoor use, for mounting on a flat surface, on an outlet box or, with the use of a spike provided, on the ground. Lenses and lens holders are also available for providing color effects.

Steber Manufacturing Co., Broadview, Ill.

Give your imagination a lift

with Corning engineered lightingware

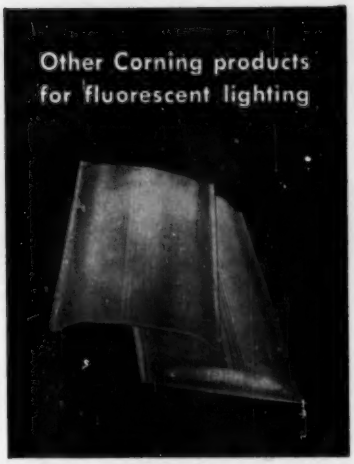
Your imagination has lots of room to work when you use Corning engineered lightingware.

You determine the lighting job you want to do—and Corning can provide lighting glassware exactly engineered for the task. And you get utility plus attractive design.

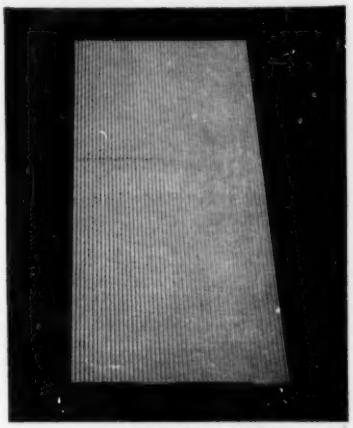
Just for an idea, take the panel the fellow in the picture is holding. It's Corning Pattern 70 Low-Brightness Lens Panel. You use this pattern to control fluorescent lighting. A pattern of six-sided pyramidal prisms directs a maximum amount of light into the useful zone and reduces fixture brightness at all glare zone angles. You can get Pattern No. 70 in single panels for troffers or for larger luminous elements.

You'll enjoy working with exclusive features like lightweight single piece lens panels and the finest water-white crystal glass. You'll find these features in Pattern No. 70—and all Corning engineered lightingware.

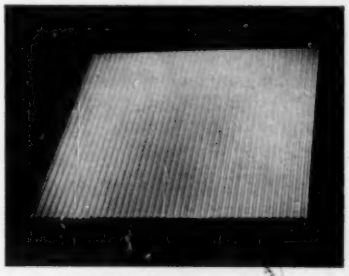
To see how much you can accomplish with efficient long life lightingware like this, contact your Corning representative. He'll be happy to help you.



LIGHTWEIGHT CURVED LENS PANEL, single piece fresnel design curved lens for two- and three-lamp troffer applications.



CRYSTA-LITE NO. 63, straight prismatic-fluted brightness controlling glass in water-white crystal.



ALBA-LITE, made in three surface textures, the standard opal diffusing glass of the lighting industry.

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CORNING, N. Y.

Corning means research in Glass

CORNING GLASS WORKS, Dept. EC-12, Corning, N. Y.

Please send me a copy of the "Architects and Engineers Handbook of Lighting Glassware."

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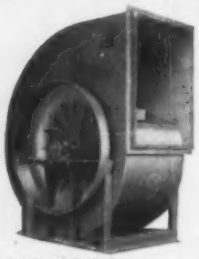
Company.....

Address.....

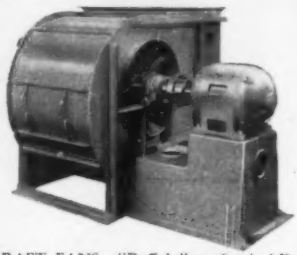
City..... Zone..... State.....

BEST GIFT for your PLANT

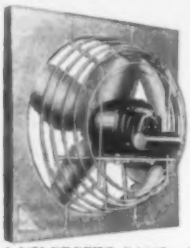
DEPENDABLE "BUFFALO" FANS with the FAMOUS "Q" Factor*



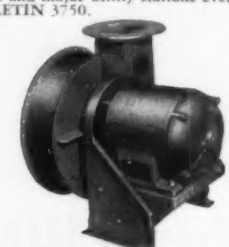
TYPE "BL" FANS — In sizes for 1,000 to 500,000 cfm, these new non-overloading fans for general ventilation and air conditioning offer even finer performance than their famous predecessors, the "LL" Fans. NEW BULLETIN F-100.



DRAFT FANS—"Buffalo" mechanical Draft Fans are helping turn out low-cost steam in plants and major utility stations everywhere. BULLETIN 3750.

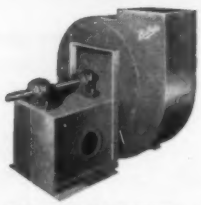


New! NV-BREEZO FANS—Their specially-shaped four-blade wheel gives high efficiency even against system pressures of ¼" and ½". 8" to 24" sizes. BULLETIN 3865.

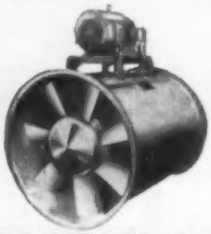


"CB" PRESSURE BLOWERS — Up to 2¼ psi, single stage with these husky, space-saving units! BULLETIN 3553.

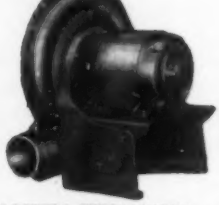
New! BELT-AIR FANS — Quiet, sturdy fans to move a lot of air at negligible cost. Heavy-gauge die-stamped blades and panel. WRITE FOR BULLETIN.



INDUSTRIAL EXHAUSTERS — All-welded for strength and high efficiency. With air or material wheels. BULLETIN 3576.



AXIAL FLOW FANS — Compact, light, highly efficient ventilating fans for light duty. BULLETIN 3533.



"E" BLOWERS-EXHAUSTERS — For low to medium pressures and volumes in draft, cleaning, line boosting. BULLETIN 3014.

"Buffalo"

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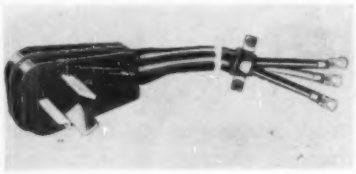
*The "Q" Factor — *The built-in Quality which provides trouble-free satisfaction and long life.*

Regulated Power Supply (34)

Conversion of ac to dc power with close regulation of dc voltage without the use of moving parts or electronic tubes is provided by new regulated dc power supplies. Ac is converted to dc by the new high ambient selenium rectifiers. The dc voltage is regulated within plus or minus 1% of the selected value by patented magnetic amplifiers. Units range from 5 kw to 50 kw, and each unit is complete and self-contained, including magnetic-amplifier regulator, line contactor, protective equipment, meters and cooling fan. Standard models available are 5, 7.5, 10, 15, 25, 37.5 and 50 kw. Dc output is 125-volt or 250-volt, either voltage obtainable by an internal reconnection.

Vickers Electric Division, Vickers, Inc., 1815 Locust St., St. Louis 3, Mo.



Dryer Cord Set (35)

A new dryer cord set has been added to this molded rubber cord set line. Made with an L-shaped grounding blade, for use with flush or surface receptacles with an L-shaped grounding slot, it is for dryers and other appliances and equipment which require only 3-amp service under NEMA standards and the new UL code. The stock line includes lengths from 36-in. up, made with three No. 10 conductors. It is rated at 30-amp, 250-volt.

Royal Electric Co., Inc., Pawtucket, R. I.

Baseboard Heater (36)

A new electric radiant glass heating panel is now available for baseboard mounting. The unit features a hooded deflector built into the top of the frame, eliminating wall streaking. Panels are constructed of specially tempered glass fused with aluminum strips. Infrared radiant heat waves are projected forward by means of a reflector behind the glass. Even at the maximum temperature of 300F, no blistering or searing results from direct skin contact with the panel. Units

may be mounted end to end in continuous row along baseboards and are suited to individual use under picture windows. They may be zone controlled by thermostat. Frame size is 9 inches high by 48 inches long; glass size is 6 inches high, by 45 inches long. Rating is 750 watts, 245 volts ac or dc. Available in neutral hammertone gray.

Continental Radiant Glass Heating Corp., One East 35th St., New York 16, N. Y.

Lighting Fixtures (37)

"Modular Sightrons" are for continuous or individual ceiling or wall mounted lines of light in corridors and utility areas. Fixtures are engineered to be joined together, end to end; they are suitable for use in retail stores, hospitals, hotels, and office buildings as well as private residences. The basic modular diffuser, measuring two feet in length, is housed in fixtures two, four, or eight feet long. Units are available with either 2-ft, 20-watt trigger start fluorescent lamp, or with one or two 4-ft, 40-watt rapid start lamps. Two 4-ft 40-watt rapid start lamps are used in an 8-ft unit. Wall mounted Modular Sightrons have outlets for plugging in electrical appliances, and knockouts for switches. They are especially applicable in kitchens and bathrooms.

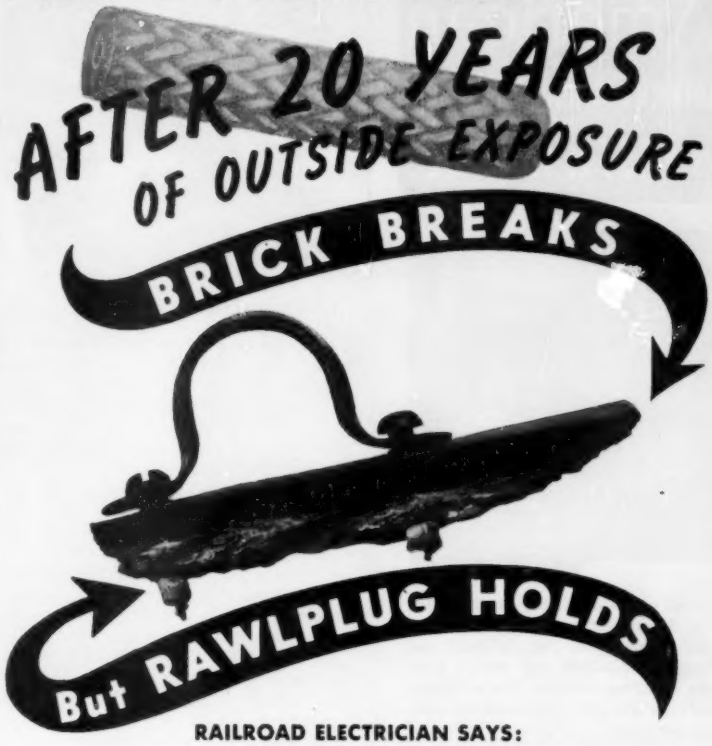
Lightolier, Inc., 11 East 36th Street, New York, N. Y.

Rigid Conduit (38)

A new heavy-duty rigid steel electrical conduit, Superduct, has been especially designed to provide long life under severe corrosive atmospheres. The new conduit proved superior to other corrosion-resistant conduit in withstanding the attacks of sulphuric acid, caustic lye, salt spray and heat. Superduct is galvanized by the Sherardizing process. It is then coated with a special vinyl chloride copolymer, pigmented and plasticized enamel finish, inside and out.

National Electric Products Corp., Gateway Center, Pittsburgh, Pa.

PROOF of HOLDING POWER . . .



RAILROAD ELECTRICIAN SAYS:

"I am sending you a sample (see photo above) of what they (Rawlplugs) are capable of doing . . . We were removing some old conduit from an outside wall and this piece of brick was pried off with the 1" conduit used as a lever.

I cannot remember how long these plugs had been installed, but believe it to be between twenty and thirty years."

J. G. COLWALL, Montgomery, Alabama

When you require maximum holding power and the least drilling time (you drill smaller holes) use Rawlplugs.

VOTE HERE . . . GET SAMPLES . . .

Request samples by attaching coupon below to your business letterhead.

MARK X for the products you have used.

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☐ RAWLPLUGS: Universal screw anchor for any material. The original fibre plug for wood and lag screws.

☐ RAWL-DRIVES: Drives like a nail into a drilled hole. Holds like a bolt. Use only in hard materials.

☐ RAWL-TAPERS: A machine screw anchor that fits the hole drilled either by a new or worn drill.

☐ RAWL TOGGLE-BOLTS: For anchoring any fixture or utility in hollow walls or ceilings.

☐ RAWL CARBIDE DRILLS: Spiral precision tool for rotary drill or hand brace. Sizes 3/32" to 1½".

☐ RAWL HAMMER-SETS: Heavy duty threaded type machine bolt anchor.

☐ RAWL-ANCHORS: For holding bolts permanently in materials such as concrete, marble, stone, brick, etc. Heavy duty type.

☐ RAWLDRILLS: For drilling holes in all masonry. Easily sharpened. For hand and power drilling.

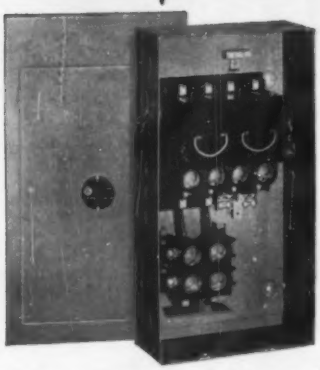
☐ DIMENSIONAL CHART of above products

SUPPLIER .....

THE RAWLPLUG COMPANY, Inc.

271 CHURCH STREET • NEW YORK 13, N. Y.

American
Service Entrance Equipment is EASY to INSTALL!



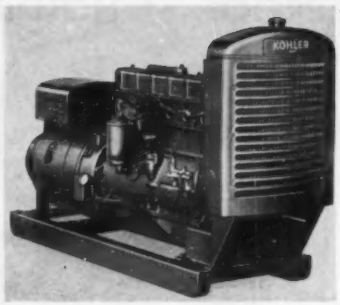
Typical of the clean, functional design of all American Service Entrance Equipment is this Fused Pull-out Main and Range combination unit with 8 plug fuse lighting circuits. The following features simplify installation and maintenance:

- Plenty of Knock-outs—the right sizes in the right places
- Generous wiring space
- Grounded neutral connections at TOP and BOTTOM—for maximum cable economy
- Solderless lugs for line, load and sub-feed connections
- Cover easily removed by loosening one screw
- One-piece door and trim with spring catch
- Lighting circuits arranged for easy wiring
- Furnished in flush or surface mounting types
- Flush mounting type available with studding brackets
- Main and Range combinations are available in either series or parallel wiring
- Parallel wired unit has 100 amp. capacity line connections
- Wide range of types permits selection of correct combinations for specific job.

Write for complete descriptions and list prices

American
ELECTRIC SWITCH DIVISION

THE CLARK CONTROLLER CO.
8146 East 152nd St. • Cleveland 10, Ohio



Electric Plant (39)

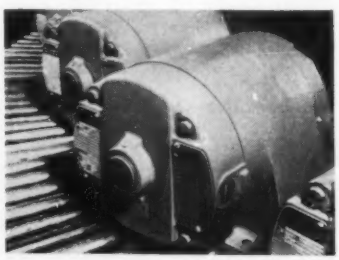
A new 15 kw gasoline-powered ac electric plant is available in six different models with remote control on stand-by starting, and with varying voltage outputs. The plant is water cooled with a large radiator, belt-driven centrifugal pump and blower fan. It features an adjustable jet carburetor with automatic choke and a mechanical fuel pump with oil bath air filter. The 6-cylinder engine produces 51 hp at 1800 rpm and has a 3½-in. bore and 3¾-in. stroke. Remote starting is accomplished through an on-off switch on the plant or by a 2-wire remote control. Stand-by starting, which automatically starts the plant and transfers the load whenever regular service fails, is through an emergency transfer panel with a 75-amp built-in transfer switch.

Kohler Co., Kohler, Wis.

Filler Tape (40)

A new, black filler tape, known as "Bishop No. 125 Electrical Filler Tape", is an insulating compound in the form of a thick tape, wound together with a fabric separating strip to form a roll. Areas to be built up can be thumb-molded to shape, and thicknesses pressed on at low spots with pieces of filler compound torn from roll and squeezed to correct dimensions. It is also practical for covering sharp-cornered electrical connections, and padding edges of bus bars. Tape is available in rolls 1½-in. wide, having a tape thickness of ⅛-in.

Bishop Manufacturing Co., 2 Canfield Road, Cedar Grove, N. J.



Motor (41)

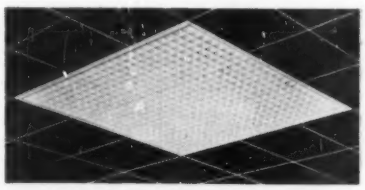
A complete new line of Tri-Clad "55" single-phase capacitor motors featuring higher full-load speeds, higher overload capacity, and higher breakdown torque. These motors are part of G.E.'s new series of Tri-Clad "55" motors, built to latest rerated NEMA standards. Starting is accomplished by a centrifugal mechanism which throws out when motor is up to speed, disconnecting starting capacitors and switching windings from starting to running condition. Transfer switch is a totally-enclosed, snap-action switch with contacts protected from foreign matter. A fibre terminal board is accessible behind a cover plate at one end of the motor. By reconnecting the leads, motor can be changed from 115-volt, 60-cycle to 230-volt 60-cycle operation, and by interchanging two leads, motor rotation can be reversed. Single-phase motor is available in the standard, foot-mounting, and in vertical, D-flange and C-face, close-coupled pump, or resilient-base mounting. All of these are available in either the standard dripproof enclosure or the totally-enclosed, fan-cooled enclosure for applications where motor will encounter severe contamination or weather conditions. Available in ratings 1- to 5-hp.

General Electric Co., Schenectady 5, N. Y.

Lampholder (42)

A two-circuit lampholder, in brass or phenolic construction, is available with pull chain, molded lever, plain brass lever or red plastic pushbutton. Each model contains a No. 41 Levolier switch mechanism. Additional versatility in the lampholder line is provided by a new phenolic lampholder with shade threads, which will take a shade screwed directly to the lampholder. For use on lamps in either single or two-circuit models. The two-circuit models are 250-watt, 250-volt and operate in sequence: high, medium, low and off. Single-circuit models are 660-watt, 250-volt.

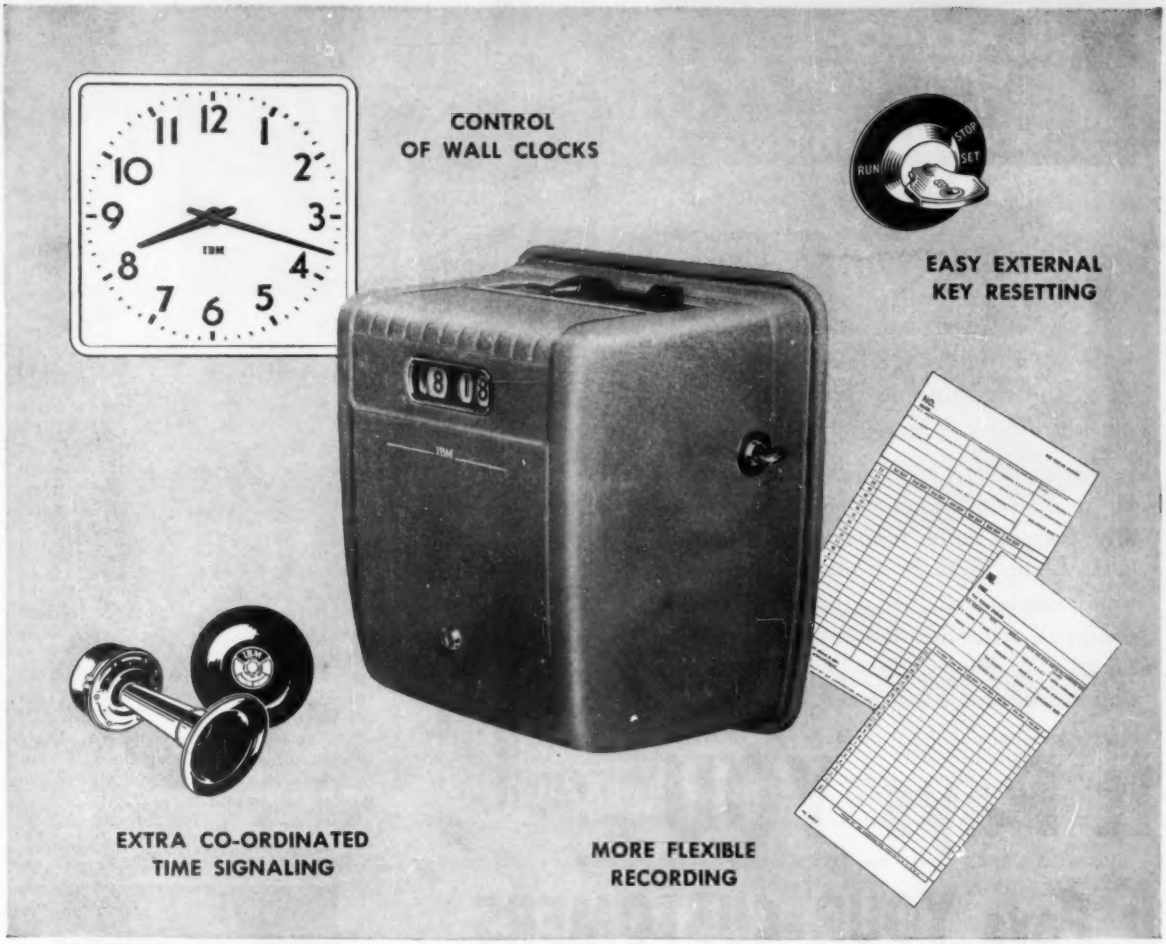
McGill Manufacturing Co., Inc., Valparaiso, Ind.



Lighting Fixtures (43)

Surface and recessed type Baylite lighting fixtures offer modular large area light sources. Units are available in a wide range of sizes: 5 ft. by 5 ft., 4 ft. by 4 ft., 2 ft. by 4 ft., 2 ft. by 2 ft., using 4, 6, 8 and 10 lamps, both standard fluorescent and slimline. The 2-in. square metal eggcrate louvers are hingeable and removable from either side. Plastic louvers are also available. Surface mounted units can be installed either singly or in groups side by side to form patterns on the ceiling or to give a louverall effect. Each fixture can be equipped with a Lite-Gard fusetron fuse to protect against thermal and electrical overload. The units are designed for stores, offices, windows, bay areas and corridors.

Electro Silv-A-King Corp., 1535 S. Paulina St., Chicago, Ill.



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Save time, effort, money by eliminating need for manual supervision in control of lighting, heating, air conditioning, ventilating, and water flow.

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Feature around-the-clock self-regulation . . . as much as 12 hours when required. Need no special clock and signal wiring. Easy, economical to install, alter, expand.

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C-o-o-l OPERATION *through* **SCREEN VENTING**

Yes, cooler, safer and more trouble-free operation — longer and better protection — with Pierce Fuses! Their venting permits free flow of air through the interior — keeps fuses 10 to 40% cooler — prevents afterblow by permitting dangerous gases and pressures to vent if a link lets go to protect equipment.

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TO STANDARDIZE ON

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QUALITY FUSES

(Also a complete line of quality non-renewable fuses.)

WRITE TODAY for this helpful booklet on fuses that positively avoid afterblow.

PIERCE RENEWABLE FUSES, INC.
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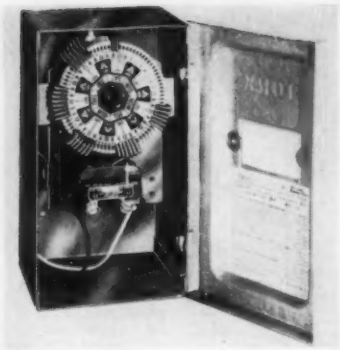


Time Switch (44)

A full week's scheduling of automatic ON-OFF control without manual resetting is now possible with the Tork 7-Day Dial. This new switch for automatic control of electrical devices permits the programming of operations without the need for manual control to alter schedules as daily needs require. Dial is sectioned and marked for each day of the week, with each of the sections slotted to accept programming tabs. Divided into 2-hour periods, at even hours, there are a total of 84 slots. Switch is installed in the line to the device to be controlled, and is in the OFF position. Tabs are inserted in slots for hours that ON operation is required. As the dial slowly rotates, the tabs reaching the ON contact close the circuit to the device. When the last tab passes, the contacts open.

Tork Clock Co., Inc., Mount Vernon, N. Y.

Pendant Fixtures (45)

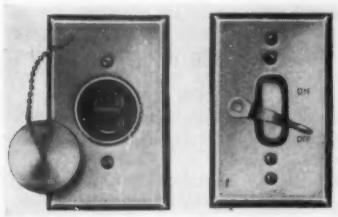
Polished brass and decorator colors highlight a new group of Lytecaster ceiling fixtures designed for both modern and traditional decorative schemes. These pendant mounting units can move up or down on pulleys, or glide across the ceiling on a track, putting light where it is needed. Shields are shaped like flaring cones or buckets; dome reflectors are used, with white undersides for maximum reflectance. Designed primarily for living rooms and dining areas, units provide a spread, diffused light output, utilizing perforated metal cases, diffusers of glass or plastic or metal web with plastic.

Lightolier, Inc., 346 Claremont Ave., Jersey City 5, N. J.

Custom Faceplates (46)

Special faceplates, made to any contractor's or engineer's specifications, for electrical outlet boxes, are now available. A custom fabrication service has been set up to answer the need for special faceplates in such interiors as hospitals, hotels and institutions. Single job-lots involving special stampings and finishing make up the standard operation of this new service. Faceplates of from one to six gang, with outlets in any sequence, are available at standard prices. Sizes over six gang are also available. Plates are .036-in. gauge stainless, satin finished and lacquer coated. Any size, shape, type or finish can be supplied.

Colonial Electric Co., 11462 Euclid Ave., Cleveland 6, Ohio.



Switches and Receptacles (47)

New weatherproof switches and receptacles are ideal for all outdoor use—on porches, patios, garages and industrial installations. The single pole and 3-way switches are fully enclosed. Switches are lever operated so switch mechanism is fully protected against rain, snow and all moisture. The single and duplex outlets are permanently weatherproof for plugging in all outdoor lighting and appliances such as outdoor grills. Also for industrial installations and indoor use in damp places such as laundry rooms and basements. Plates are corrosion resistant and outlet has a cover on chain which can be screwed into outlet when not in use.

Leviton Manufacturing Company, 236 Greenpoint Ave., Brooklyn 22, N. Y.

Air Cleaners (48)

A new line of electronic air cleaners has been developed for large commercial and industrial installations. In this new line, ionizing-collecting cells are built-up to fit the exact specifications of the particular job. As a result, manufacturing plants, institutions, hotels and office buildings can install correctly-sized electronic air cleaners in conjunction with their heating and cooling plants. Units have all aluminum framework, eliminating the possibility of rust. The "Custom-Line" packaged air cleaner is available up to 12,600 CFM capacity at 90% efficiency; it may be floor mounted or suspended. Unit operates by ionizing particles of dust, soot and pollen in the contaminated air stream. These particles are deposited on plates from which washing manifolds flush the dirt away.

Electro-Air Cleaner Co., 1285 Reedsdale St., Pittsburgh 33, Pa.

a **new** departure in design and appearance

200 or 300 WATT

SQUARE **RECESSED DOWNLIGHT**

- Square, silver-mirrored Permaflector, lamp and lens positioned for maximum efficiency with controlled brightness.
- Choice of extensive distribution, intensive distribution and drop bowl lens.
- Designer styled one-piece die-cast frame with concealed hinges and latch.
- Inconspicuous finger-pull for easy opening and maintenance.
- A readywired "packaged" unit with many labor saving installation features.
- Designed to recess into a 12" accoustical module.

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Yes—I want to know more about the new silver-mirrored square downlights. Send Specification Sheet.

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pulls cable through all types of conduit . . . open or concealed

Here's an on-the-job view of a standard GREENLEE Cable Puller with a flexible elbow attachment making simple work of what could have been a mighty tough job.

In about five minutes, three 1,000,000-circular-mil cables were pulled through an 80-foot length of 4-inch conduit which is some 18 feet above the floor level. Setup time included, the entire job took approximately an hour and was handled simply, easily.

Whether you have high overhead jobs like this calling for the use of the attachment, or more routine work, you'll find the GREENLEE Cable Puller a big timesaver that helps get the job done faster, at lower cost. With it you *pull in line with the conduit*. When used without attachments for concealed conduit work, it clamps directly on the conduit. You get a fast, easy pull without straining conduit hangers and eliminate heavy, cumbersome equipment. Use it for open or concealed conduit . . . high up, in close quarters, or out in the open.

It's a powerful puller . . . exerts a maximum pull of 7,500 pounds and has two speeds: one for fast work, the second for a steadier, heavier pull.

Portable, easy to carry, set up and operate. Write today for complete reference folder on this and other GREENLEE timesaving tools for electricians. Greenlee Tool Co., 1752 Columbia Avenue, Rockford, Illinois.

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OTHER GREENLEE TIMESAVING TOOLS FOR ELECTRICAL WORK
Hydraulic Conduit Benders • Tubing Benders • Auger Bits and Drills • Knockout Punches • And many more

Process Timer **(49)**

A new process timer, featuring "one knob" control, designated TSA-21. It will control the timed simultaneous closing of one electric circuit and opening of another. Industrial applications for the new process timer include moulding presses, machining tools, and automatic mixing operations; in addition power distribution equipment requires precision control for starting automatic substation equipment, and for reclosing of automatic circuit breakers. It includes one set of time-opening main contacts and one set of electrically separate time-closing main contacts. Trip point of main contacts can be adjusted by an external knob. Time scale is calibrated from 0 to 100%. It weighs 6¾ lbs and measures 5¾-in. by 5¾-in. by 8$\frac{5}{32}$-in.

General Electric Co., Schenectady 5, N. Y.

Product Briefs

(50) A new line of **cable staples,** called "Hold-Tite, has been announced by E. H. Titchener & Co., Binghamton, N. Y. . . . (51) Electrical outlet metal **wall plates** styled with antique finishes of gold, chrome or black wrought iron have been introduced by the Bell Electric Company, Chicago, Ill. . . (52) Unimatic Corporation, Union, N. J., has developed new ⅜-in. 45-deg. threaded angle **connectors.**

(53) Nadex Corporation, Chicago, Ill., has announced a new **air cleaner** for the home, called Dustronic. . . . (54) Development of a new type of mobile electric power **generating plant** designed to meet what utility engineers call "fringe area interim boosting has been announced by Electro-Motive Division of General Motors, La Grange, Ill. . . . (55) Two heavy-duty and one light duty **thermostats** for use with ribbon heat and similar heating tapes in preventing freezing of water pipes, in keeping viscous fluids free-flowing and similar industrial applications have been introduced by Cox & Company, Inc., New York, N. Y.

(56) Georator Corporation, Manassas, Va., has announced a newly improved, variable-frequency, variable-voltage **converter.** . . . (57) a new 500-hp, armored mill **motor,** with increased commutating capacity and a higher continuous-rated torque has been announced by General Electric

Co., Schenectady, N. Y. . . . (58) A new, lightweight hydraulic hand tool for users of solderless terminals on wire sizes 8 through 2 has been introduced by Aircraft-Marine Products, Inc., Harrisburg, Pa.

(59) A new wrenchless power grip type-⅛-in. to 2-in. pipe machine **chuck** which can be "sized by an easily operated hand wheel is now being marketed by Beaver Pipe Tools, Inc., Warren, Ohio. . . . (60) Hykon Manufacturing Co., Alliance, Ohio, has introduced a new portable extension **cord reel**, equipped with lead in cord and continuous current collector. . . . (61) A new service utility **ditcher**, Buckeye model 403, has been developed by Gar Wood Industries, Inc., Wayne, Mich.

(62) Eagle Electric Mfg. Co., Inc., Long Island City, N. Y., is marketing a complete new line of 3-way flush toggle **switches**. . . . (63) R. G. Genzlinger, Inc., Neshaminy, Pa., has developed a new **safety device**, called Silent Sentry Model TGS 150, for preventing bodily harm to operators of machinery. . . . (64) A new one-half inch size **bushing** for electrical connections has been announced by National Electric Products Corp., Pittsburgh, Pa.

(65) Line Material Company, Milwaukee, Wis., has announced that Type L **signal arresters** have been rerated for application dc circuits of 0-125 volts and on ac circuits of 0-175 volts. . . . (66) International Oil Burner Co., Fan Division, St. Louis, Mo., has announced a new line of window **fans** in which are featured deluxe and reversible 20- and 24-inch models.

(67) Three new features have been added to the type JKP-O 600-volt indoor-outdoor, butyl-molded, current **transformers**, developed by General Electric Co., Schenectady, N. Y. . . . (68) National Electric Products Corporation, Pittsburgh, Pa., has announced a redesigned **Bondnut**, which offers easier installations in locking electrical conduit and fittings at panel and junction boxes. . . . (69) Safway Steel Products, Inc., Milwaukee, Wis., has introduced a rolling **work tower** with new flat-tread stairs.

(70) A new end-mounted fractional horsepower **motor**, equipped with a special new grease for increased bearing life, has been announced by General Electric Co., Schenectady, N. Y. . . . (71) Wodack Electric Tool Corp., Chicago, Ill., has designed a portable electric **plaster cutter**. . . . (72) Santa Fe Tank & Tower Co., Inc., Los Angeles, Calif., has announced a new dual-safety **switch**—a combined "vibration cut-off" and "safety switch" for cooling tower fans.

(73) Nepo Manufacturing Co., Chicago, Ill., has announced a new **pole-top adapter** system, designed to fit atop any standard 2-in. to 4-in. diameter pole. . . . (74) New fixed paper-dielectric **capacitors** in drawn rectangular cases for motor, industrial control, filter, luminous-tube transformer, and other ac or dc applications have been developed by General Electric Co., Schenectady, N. Y.

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available from 10,000 to 45,000 watts (34,150 to 153,675 btu). Adjustable louvers permit directing heat into working zone. Model 14-10 illustrated.

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Catalogs, Bulletins and Engineering Data

(75) ANCHORING DEVICES. Selector chart describes proper applications for complete line of expansion shields, toggle bolts. U. S. Expansion Bolt Co.

(76) GENERATING PLANTS designed especially for battery charging are rated at 10 and 15 kw. Dimensions and data. Form A368-954, 2 pages. D. W. Onan & Sons Inc.

(77) CERAMIC LAMPHOLDER and reflector unit for use with the new quartz infrared heat lamps is designated the HCL. Chrome-plated steel reflectors are parabolic in shape; rear terminals and regular dimensions of units permit of multiple mountings which obtain up to 4000 watts per sq ft. 2-page sheet gives specifications and prices. Miskella Infra-Red Co.

(78) HIGH VOLTAGE STARTERS for motors rated at 2200 to 5000 volts. Basic element is the ZHA 50,000-kva air-break contactor. Accessories are available to limit higher fault currents. Folder 1060. Electric Controller & Mfg. Co.

(79) EXPANDING MANDRELS provide precision arbors for rotating parts under repair or inspection. 11 sizes have diameters ranging from $\frac{1}{8}$-in. to 7-in. 4-page bulletin LC 1054. LeCount Tool Works Inc.

(80) VOLTAGE REGULATOR for 400 cycle machines has no tubes or moving parts. 4-page bulletin T-8400 covers construction and operating characteristics. Leach Corp.

(81) VAPORTIGHT FIXTURES for 100- or 200-watt lamps are made of cast aluminum for pendant, wall, or outlet box mounting. Prices. Bulletin 138-54. Steber Manufacturing Co.

(82) SHOCK AND VIBRATION ISOLATORS. Complete specification and application data on series 5200 mounts. Bulletin 541, 8 pages. Barry Corp.

(83) CIRCLINE FIXTURES feature perforated steel louvers. Models available for 32- or 40-watt lamps or both. Carter Lighting Co.

(84) SPEED VARIATORS are packaged adjustable voltage dc drives operating from ac power. Design and operating features, ratings and dimensions are included in 4-page folder GEA-6180. General Electric Co.

(85) CABLE TROUGH systems are available in five sizes from 6-in. to 24-in. widths; standard height is 3 in. 8-page bulletin 754-A illustrates entire line of fittings. Bulletin 1054B describes Twist-Rack brackets for supporting trough or conduits; 4 pages. P-W Industries, Inc.

(86) RECTIFIERS for heavy duty installations are rated up to 500 kw. Detailed description of 72-kw magnetic-amplifier-regulated selenium unit is included in bulletin HDR 854. Perkin Engineering Corp.

(87) WIRE HANDLING TOOLS listed in 8-page catalog include the Stripex for stripping, cutting, slitting, and an assortment of fish tapes and reels; also a box hanger that permits wire to be pulled in before the box is mounted in the wall. Burbank Electrical Products.

(88) PROTECTIVE CLOTHING for outdoor construction crews. Catalog 1955-D2, covers boots, jackets, hats and coveralls designed for various degrees of activity and cold. 8 pages. John E. Dorsey Co.

(89) PORTABLE GENERATORS, available in 10 models, include provision for remote starting and battery charging installations. Another bulletin describes a line of one-man operated, portable earth digging machines. Multi-Matic Corp.

(90) FLUORESCENT STRIPS in a variety of sizes from one 15-watt T8 to two 64T6 slimlines. 8-page folio 578 illustrates each of the four lines and accessory fittings for special installation problems. Wiremold Co.

(91) ROTARY CONVERTER. A condensed catalog describes characteristics and capacities of the series K heavy-duty, industrial-type units. Bulletin 420. Gothard Mfg. Co.

(92) INSPECTION LIGHT operating on 110v ac current consists of an 18-in handle with lamp in the end, a light-weight transformer housing and 20 ft of cord. Smaller unit and two portable vaporproof lamps are also described in sheet 54-1. Ericson Mfg. Co.

(93) CABLES. A fine new 128-page catalog of rubber-insulated, neoprene-sheathed cables rated up to 5 kv. Each design feature is discussed as to its effect upon performance. Extensive information is included on installation and handling techniques and splicing methods. Data section has current-carrying capacity tables for special enclosures. OK-1085. Okonite Co.

(94) ELECTRIC HAMMERS are featured in a 25-page tool catalog designated 5410. Four hammers having capacities of $\frac{5}{8}$, $1\frac{1}{8}$, $1\frac{1}{2}$ and 2 inches are available as well as 17 types of tools to be used with the hammers. Also described are drills, saws and grinders. Syntron Co.

(95) WIRE AND CABLE bulletin 19-354 contains application, product, and technical information on Flamenol cable for machine tool, appliance, and other electric equipment uses. Data is also included on gasoline-and oil-resistant wire, bus drop cable, neon sign cable, and audio drive-in theater cable. General Electric Co., Construction Materials Division.

New Books

NEC Handbook (96)

The new edition, 8th, of Abbotts National Electrical Code Handbook is based on the current 1953 edition of the Code. The revision was made by Charles L. Smith, Electrical Field Engineer, of the National Fire Protection Association who is well qualified to carry on the work developed by the late Arthur Abbott.

The purpose of the book is to guide the reader to a ready understanding of the general plan, scope and intent of the National Electrical Code and given detailed discussion and commentary on its individual provisions and requirements.

The eighth edition carries forward the work inaugurated by Abbott in 1932 and continued in successive editions until his death. However, the present edition has been changed in format to follow more closely on the arrangement of the National Electrical Code. The paragraphs and article numbers are now identical with those of the Code.

Abbott has long been a "must" for everyone concerned with the design and application and installation of electrical wiring systems. The new edition brings this essential work into conformity with the new Code. McGraw-Hill Book Co., 642 pp., $2.50.

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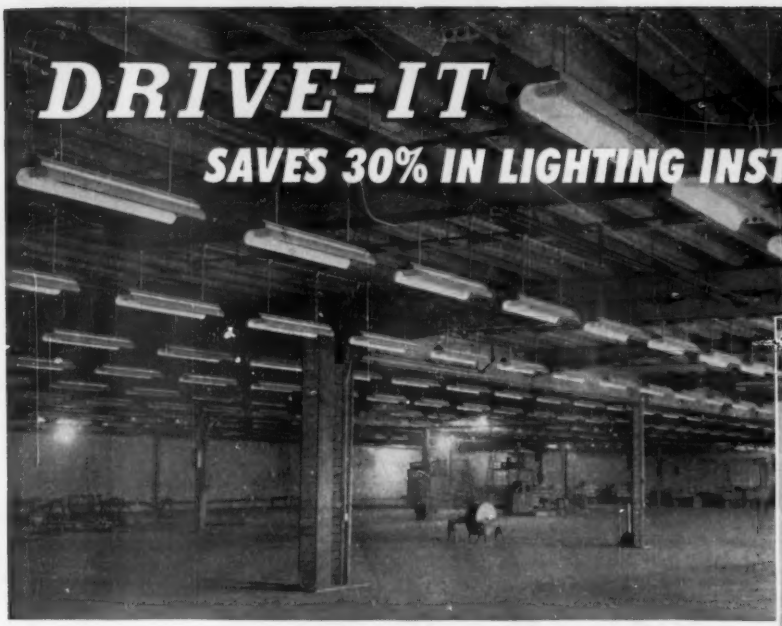

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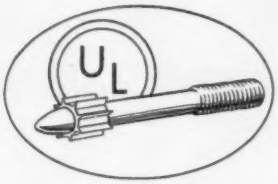

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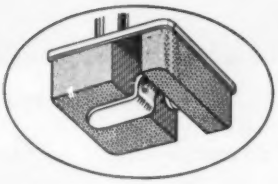

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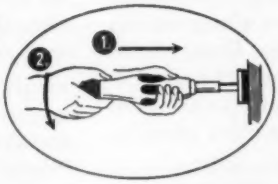

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What Kind of Motor Is It?

QUESTION W26—I have a motor about the size of an ordinary ¼ hp motor from which the nameplate has been removed. I do not know what voltage it should be used on or whether it is for ac or dc.

It has two brushes set on opposite sides of a commutator and there is no brush lifting mechanism. There are two laminated poles, but the frame does not seem to be laminated.

Can some of your readers suggest any means of finding out whether this is an ac or dc motor and for what voltage?—E.E.M.

ANSWER TO W26—Look at size of wire and type of insulation. From this you can determine its allowable current. Change ¼ hp to watts by multiplying by 746 watts. To determine input divide by efficiency .6. This will give you input approximately in watts. Dividing input watts by current you will get approximate volts. Use nearest standard voltage. Use allowable current capacity when wound as a coil, also check insulation resistance of motor to see if it is O.K. for voltage computed. Fuse it for allowable starting and running amperes.

The magnetic circuit of an ac motor should be laminated for best results. Try using it on dc and check its operation on ac. It may be a compromised design between ac and dc. Check its temperature rise on first operation to see if it is excessive. If excessive, reduce load to a not excessive temperature rise. A universal motor will not work as good as a straight ac or straight dc motor.—E.B.

ANSWER TO W26—The first thing to be considered is whether the motor is an ac or dc motor. The source of the motor such as from a home appliance, a repair shop or a mill may be a clue as to its frequency rating. Most home appliance motors are ac, while those from other sources can be either ac or dc or both. Considering the problem from a construction viewpoint, a dc motor invariably has solid pole pieces attached to the yoke of the motor by heavy bolts which are readily visible and windings on the pole pieces. The components, including field coils, brushes and armature, are connected in series. Also the commutator end has a larger end bell. This brings us to the series or universal motor, which operates on either ac or dc.

Here again the components are in series and the pole pieces may be solid or laminated. Since the pole pieces of your motor are laminated, this is an indication of an ac motor, as the motor would heat considerably if ac were applied to a motor having solid poles.

However, dc on an ac motor would also spark excessively at the brushes provided a brush covers two commutator segments. Next, the repulsion induction ac motor must be considered with distinguishing features of short-circuited brushes where the two brushes are connected by a piece of brush lead, and a short-circuiting device or necklace, even though there is no brush lifting mechanism. If more than two leads are brought out for supply voltage this is an indication of dual voltage. The voltage rating can be 110, 220, 440 or any number of values.

However, in all probability you can be safe in applying 110 volts. If the motor crawls and does not reach high speed the rating should be higher. If it reaches high speed and can be stopped by light pressure a higher voltage can be tried. These are simple visual tests on construction and trial and error in voltage rating. A more complete test can be obtained from dynamometer tests.—J.B.K.

Cooling for Power Cables

QUESTION Y26—I have seen many published accounts of various cooling means for neoprene power cables, including open air installations, water and sand in the trench fills. Do any readers have experience with altering the original soil conditions and increasing original soil thermal conductivity for better heat dissipation of these underground type cables?—L.W.F.

ANSWER TO Y26—L. H. Fink, Philadelphia Electric Co., has published AIEE paper 54-75 in Power Apparatus and Systems of April 1954, pp. 406-412 entitled: "Control of the Thermal Environment of Burial Cable Systems". Discussion of the paper by engineers from New York, Chicago and Detroit supplements this valuable contribution.—L.F.R.

ANSWER TO Y26—Forced air or forced liquid in a conduit that includes the wire is best. Next best is to have the wires in a separate conduit. A thermostat at the air or liquid outlet would indicate the average temperature. Mixtures are subject to sun heat and movement of soil.—H.S.

Amplidynes and Motor Control

QUESTION Z26—A large vertical boring mill has two motors which are amplidyne drives and have a complicated control system. What is gained by such a system? What is the difference between the amplidyne drive system and others such as Thymotrol? How is it different from the Ward Leonard drive?—J.H.B.

ANSWER TO Z26—The Ward Leonard system utilizes the principle that the speed of a dc motor that is separately excited will have a relationship to the impressed voltage on the terminals of the armature.

V = (terminal) = IR KØS where KØS = counter EMF.

K = A constant of the motor

Ø = Magnetic flux of field (constant)

S = Speed of motor (variable)

The larger part of the voltage drop is CEMF, therefore, it can be assumed that the speed is proportional to the impressed voltage, at least at the higher speeds. (See Figure 1.) The voltage E, is proportional to the generator field current, therefore by varying field current, motor speed can be varied.

If it is desired that a lower controlling current input be used, a smaller generator G_B can be used to feed the field of G_A. Then we have two generators in cascade, in much the same manner as the tube stages in a radio set. (See Figure 2.)

We can then consider each generator as a rotary amplifier. These generators, as well as an auxiliary generator to supply the constant field current to the motor, can all be driven by the same supply motor. The amplidyne is a two stage rotary amplifier. (See Fig. 3). It takes the place of generators G_A and G_B. The voltage across the brushes AA is produced by the current in the pattern field. This constitutes the first stage, or the function of G_B (generator). The armature being shorted by the jumper

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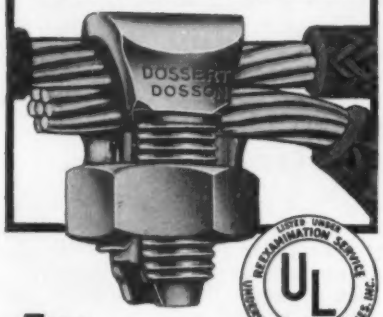

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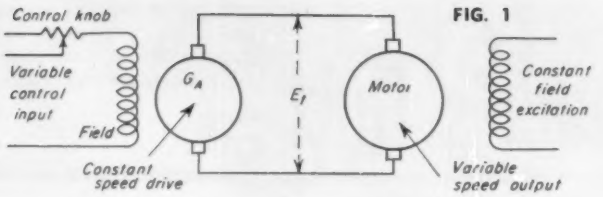


FIG. 1

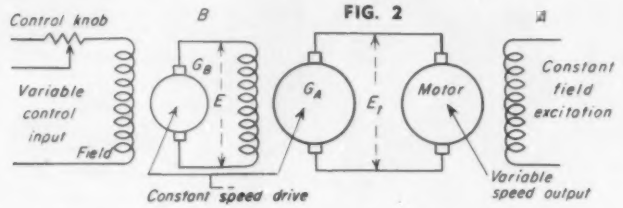


FIG. 2

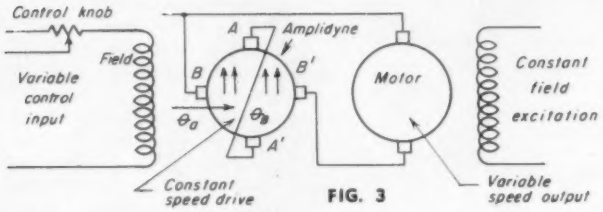


FIG. 3

across AA causes a current to flow in the armature. This produces a flux at right angles to the original flux. The armature reaction flux being much greater than the first flux causes a greater voltage to be induced across brushes BB which supply the load. The armature reaction flux to the voltage across BB constitutes the second stage. The amplidyne has the advantage that only one armature is needed for both stages. It has a faster reaction time to transients, which is a very important consideration in some applications.

The Thymotrol uses the same principle of varying the voltage across a direct current armature to effect a desired speed. It differs from the Ward Leonard system only in that rectification and regulation of current to the motor armature is basically electronic. Thymotrol is thyratron motor control.

All the above control systems have the advantage that they give a stepless speed control which cannot be duplicated by another system. Power is not absorbed to obtain the lower speeds, although some loss is due to the rotation of the additional generators. Dynamic braking can also be used to advantage, because there is always full field flux in the motor. This does away with plugging that is necessary with conventional induction motor drive on boring mills. Reversing can be accomplished by changing direction of current through the first field in rotary amplifiers. From the diagrams, it is not to be implied that these machines have only two poles.—V.C.

ANSWER TO Z26—The Ward Leonard system is a system for effecting any desired variations in the speed of a motor without incurring any rheostatic losses in the main circuit. This is accomplished by interposing a motor-generator set between the variable-speed motor and the power-supply. If the power-supply is alternating current, it is usual to employ for the motor-generator set a synchronous motor coupled to a dc generator. It is arranged that the excitation of the latter may be varied over a wide range by means of a rheostat in its field circuit. The generator's armature and the motor's armature constitute a circuit by themselves which is not interrupted in service. By simple and efficient manipulations of the field rheostats and switchgear in the exciting circuits of the generator and of the variable-speed motor, the latter's speed and direction of rotation are under perfect control at all loads. The system is regenerative; thus, when applied to hoisting, the descending load drives the motor, which, as a generator, reverses the action of the motor-generator set and returns energy to the supply system.

Basically, the amplidyne is an externally driven dc generator. However, its unique use of a short circuit and compensating windings creates such precise electrical balance that the smallest electric signal releases kilowatts of output capable of controlling the most powerful machinery. It is faithful, it is swift, the strong partner of untold numbers of electrical and mechanical devices. With strength and amazing speed, it executes the whispered orders of relays, electronic tubes, resistances, selsyns, limit switches, amplistats—

almost any source of control current. Thus, the amplidyne translates any departure from the desired performance into a powerful, precise correction to standard performance level. The amplidyne has a place wherever an electric signal can express the need for a change in process. High amplification, smooth, continuous circuit adjustment —no jerks or jumps—instant response wherein full output is reached in 1/10th of a second or less. The combination of high amplification and instant response results in force of tremendous proportions. Lack of "electrical inertia" boosts loads up to the operating requirements almost instantaneously, making machines deliver smooth, peak performance even under fast-changing conditions.

Several control fields can be built into each amplidyne. Each of these fields can be made to respond to the necessary number of signals simultaneously or separately, making it possible to combine many functions into one control unit. Because of high amplification, smaller control devices are required. The multiple amplidyne fields replace many relays and contactors. Once the amplidyne has been adjusted, uniform performance will be delivered year after year, because its characteristics are built into the system. Circuit characteristics are easily modified to meet the needs of changing operating conditions.—O.C.

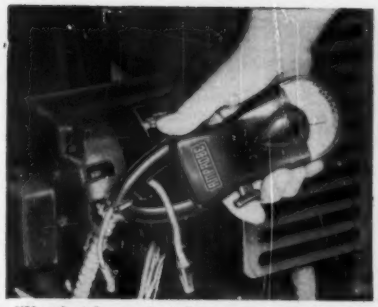
Safety Tests for Linemen's Gloves

QUESTION A27—What tests and inspections should be given rubber gloves used by linemen, and how often should they be checked?—D.H.N.

ANSWER TO A27—The gloves are washed in a neutral soap, such as Ivory and then a 20-kv test applied. If the breakdown is more than 10 milliamps, they are discarded. This is accomplished by filling the glove with water, and placing the glove in a tank of water. One electrode is in the tank, and the other electrode in the glove, with the ammeter in series. For the high potential a powerstat is used, stepped up from 110 volts to 20,000.

If the glove meets the standards, it is powdered with talcum and placed in a sealed paper bag, with data as to last inspection, and by whom. If the gloves are used, this test is given every 30 days. When they are not used, they are again tested after three months.

For your information I am including here the data on one type of equipment by General Electric which is used for this purpose, and further information may be obtained from them.



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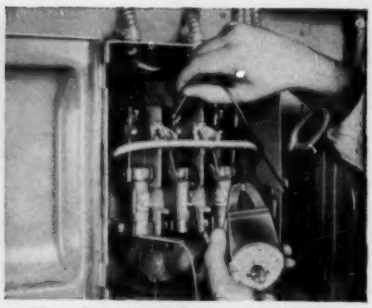

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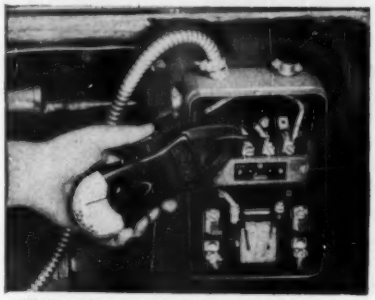

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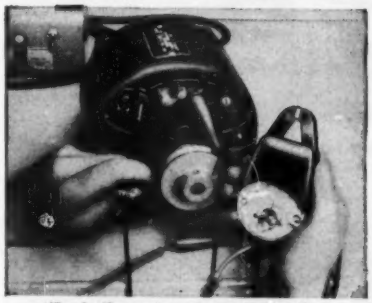

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"I can check appliance current at plug"

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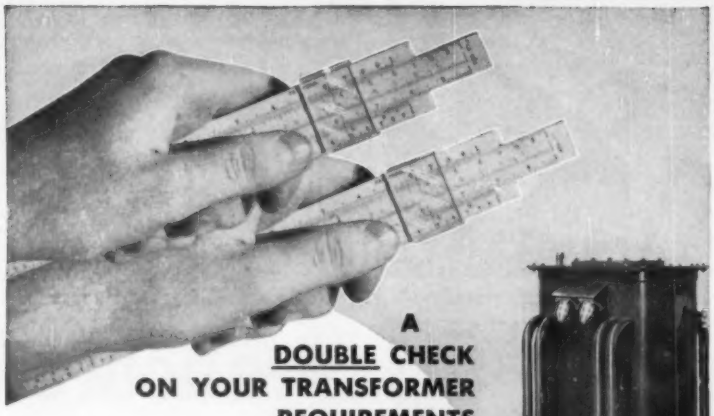

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MANUFACTURERS OF EFFICIENCY ELECTRICAL DEVICES FOR CONDUIT, WIRE AND CABLE SUSPENSION
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Testing set: No. 8804351, KVA 2, Type K, 60 cy., Form EW 115-20,000v.—J.P.

ANSWER TO A27—First—Inspect surface of the rubber gloves for cuts, cracks, burns, dead rubber, scratches, protuberances, blisters and embedded foreign objects.

Second—Give the rubber gloves the simple air test which consists of holding the sleeve end shut and rolling up towards the finger end of the glove, trapping the air inside and compressing it up in the hand part of the glove. Hold this compressed air in the rubber glove for three minutes or until absolutely sure that the air is not leaking out. The above inspection and test should be taken at least once every 30 days but can be taken as often as the individual lineman desires.

Third—the rubber gloves shall be officially inspected every 90 days by the line crew foreman and engineer from the Electrical Dept. Their test shall include the above inspection and test plus a high voltage test by A.S.T.M. specifications for the class of glove.—(A.S.T.M. Standards 1952 Part 6. Gloves, Rubber Insulating, page 34 to 40.) If the rubber gloves break down under the air test or the high voltage test, they should be discarded, not kept around to be used on lower voltages.—C.O.D.

Can you ANSWER these QUESTIONS?

QUESTION M27—Has anyone developed a way to check a 3-phase spot welder so that the operator may know every time he welds if he is getting the maximum current for each weld? We are welding a critical unit and every weld must be perfect. We do not wish to use an ammeter or oscilloscope or oscillograph.—P.J.L.

QUESTION N27—To reduce labor costs, we have adopted the practice of using large transformer cabinets for housing motor starters, associated relays for limit switches used in electronically controlled apparatus. The starters and controls are removed from their factory enclosures and mounted inside the cabinet. This eliminates the hodge-podge of short nipples and fittings, as well as saving connecting time in installing small enclosures.

We provide practically the same spacing between starters and relays as would occur if they were nipple connected. One electrical engineer main-

tains that the thermal element heat ratings should be calculated on the basis of the original enclosure rating. Another says that the additional airspace allows heat dissipation and starters should be rated as installed "open" for heater settings.

Actually the ambient temperature inside the large cabinet was practically room-temperature when it was checked with a thermometer. Have other readers run into this same problem? What is the answer?—L.W.F.

QUESTION P27—We installed a 15-hp squirrel-cage motor driving a blower on an air conditioning system. It was started across the line. The motor was mounted on concrete and the conduit to the motor was run overhead on the ceiling and stubbed down, and then a short piece of flex to the motor J box. When the motor was started and coming up to speed, the conductors in the conduit vibrated quite noticeably. When the motor reached running speed, the vibration ceased. The conductors to the motor were of the proper size, and the location of the conduit in respect to the motor was such that it was not subjected to the motor's normal vibration. Why did the conductors vibrate?—G.R.G.

QUESTION Q27—I recently stripped a GE fhp, split-phase motor and found both the running and starting windings were wound with aluminum wire. I have not been able to locate any aluminum wire to rewind it with and I would like to change the winding to copper wire. However, copper and aluminum do not have the same resistance or current carrying capacity. Would you please tell me how I can determine the correct size of wire to use and if the number of turns should be changed.—K.E.D.

QUESTION R27—The cause of overheating of a ¼-hp 115-volt single phase motor has been traced to the rotor. The rotor, a standard type with bars and fins of cast aluminum, tests ok on a growler. Is there some way to stop this overheating?—H.G.C.

QUESTION S27—In a system where 3-phase, 220, and also 110-220 single phase is taken from a delta-connected bank of transformers, why does the ground neutral to one leg show 220 volts, instead of being an odd voltage, as 180 or 260?—E.S.H.

PLEASE SEND IN YOUR ANSWER BY JANUARY 15

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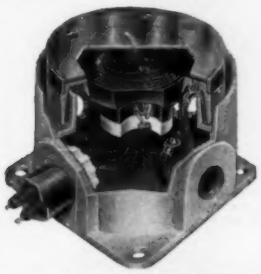

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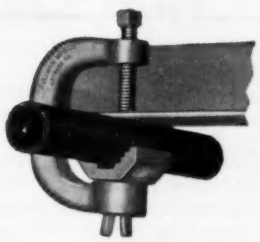

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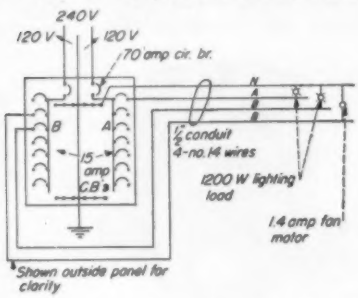
Questions on the Code

Answered by

B. A. McDONALD, *New York Board of Fire Underwriters, Rochester, N. Y.*
GLENN ROWELL, *Electrical Engineer, Fire Underwriters Inspection Bureau, Minneapolis, Minn.*
B. Z. SEGALL, *Consulting Electrical Engineer, New Orleans, La.*

Panelboard Loading

Q. *As shown by the diagram we have a 120/240-volt single phase, 3-wire lighting panel with 70-amp main circuit breaker and 14 15-amp branch circuit breakers. Lights and heaters are often used 8 to 16 hours*



steady every day. Are the 70-amp main circuit breakers heavy enough for the total load that may be connected? Is installing the heater fan conductor and using the common neutral of the light circuit a Code violation?—C. J.

A. It is difficult, from the information given, to give a definite answer to your first question without making some assumptions. Since the diagram shows the loading on only three of the 14 circuits, I assume that the pattern followed for these circuits prevails for the other remaining circuits. In other words, for every three circuits we have two used for a lighting load of 1200 watts each and one for a fan motor which takes 1.4 amps. If this is correct we would have total of ten lighting circuits each loaded at 1200 watts and four fan circuits each loaded at 1.4 amps. The total lighting load would be 12,000 watts operating at 120 volts. The current would be 100 amps and since the load is divided over the three feeder conductors, the live legs would carry 50 amps each. The loading of the motor circuits of 1.4 amps per circuit would increase this figure to 52.8 amps. Under such conditions of loading the 70-amp breakers would be large enough. I also assume in making the calculations that the lighting load has been computed in line with the requirements of Section 2116 and that the 25% penalty for long periods of use has been applied. I also assume that the individual circuits provided for the motors are intentional and additional loading will not be permitted. I also assume, as covered by Section 2125, that the branch circuits will only be loaded to 80% of their rating. Under such conditions it appears that the Code would be satisfied. If, however, as you state, a total load of 15 amps is connected to each of the branch circuits operating at 100% demand, the 70-amp breaker and possibly the panel itself could not handle the load.

The use of the neutral conductor, as shown on the diagram, where two circuits from one side of the 3-wire system are served by the same neutral, is in violation of the Code.—B.A.McD.

Outlets on Lighting Circuits

Q. *Is it true that the National Electrical Code contains a specific exemption which will permit more than ten outlets on regular lighting circuits in homes?*—M.L.L.

A. You will note in the requirement under Section 2115 that the number of general use circuits in a dwelling are computed on a total floor area basis and not on an outlet basis. Then in the third paragraph under "1" in Section 2116 you will note the following statement: "All receptacle outlets of 15-amp or less rating in single-family and multi-family dwellings and in guest rooms of hotels (except those connected to the receptacle circuits specified in paragraph b of Section 2115) may be considered as outlets for general illumination, and no additional load need be included for such outlets. The provisions of paragraph b of this section shall apply to all other receptacle outlets." Then under paragraph b of this same section you will find the requirement that for lighting other than general illumination and for appliances other than motors a load of not less than the unit load specified below shall be included for each outlet. Therefore, the only actual limitation on the number of outlets connected to the branch lighting circuits within a dwelling is the overcurrent protection device on each circuit. Therefore, in any dwelling the code requires a minimum of one circuit for each 500 square feet of floor area of each floor, including finished basement.—G.R.

Current Calculations

Q. *A 3-phase, 3-wire heater is rated at 12,000 watts on the nameplate. What is the formula for finding out the current each phase wire will carry so wire size can be determined? This particular voltage is 208, but 3-phase heaters may be for any voltage. Also 3-phase, 4-wire ranges are rated in watts and the same problem is present.—G.R.G.*

A. Assume a 3-phase, 12,000 watt, 208-volt heater. The current per line would be

$$\frac{\text{watts}}{\sqrt{3}\times\text{volts}} \text{ or } \frac{12{,}000}{\sqrt{3}\times 208} \text{ or } \frac{12{,}000}{1.732\times 208} \text{ or } 33.2 \text{ amps.}$$

Table 1, Chapter 10 shows a No. 8 type R (40 amps) or a No. 8 Type RH (45 amps) will be large enough for this load. So three No. 8's in ¾-in. conduit (or a 3-wire No. 8 armored cable, or a 3-wire No. 8 non-metallic sheathed cable, etc.,) would be the proper circuit for this heater load.

I can't quite agree with your statement in the second to last sentence. After all each heater is built for some rated voltage. It may be possible to feed the unit with higher voltage but at some point, the unit will break down (arc-over) due to some part of the electrical system being overstressed at this higher voltage.

It should be remembered that the resistance is the only fixed value, more or less, in the heater load. Thus for the 12,000-watt, 208-v, 3-phase unit above, we can assume the units are connected in "wye" (120/208 volts would so indicate); therefore, the value of the line current will be equal to the phase current or from the above calculation, 33.2 amps. Since this is

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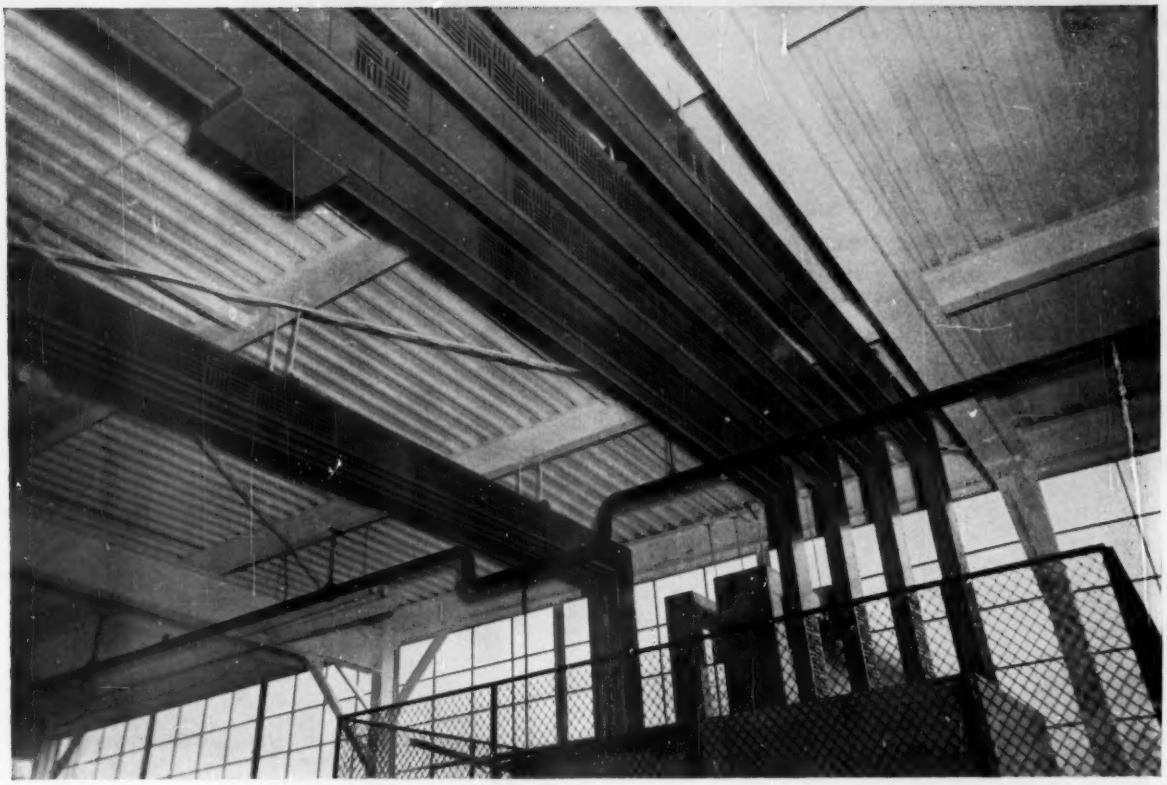

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Westinghouse bus duct with aluminum bus bars is lighter. Rating for rating, it weighs about one-third less than bus duct with copper bus bars, giving these distinct advantages:

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Retains all inherent advantages of copper bus duct—such important, money-saving advantages as: flexibility to minimize downtime when machine locations are changed, economy since parts are completely salvageable when plant change-overs occur, safety because of completely protected plug-ins, and strength due to the four channel steel enclosure construction.

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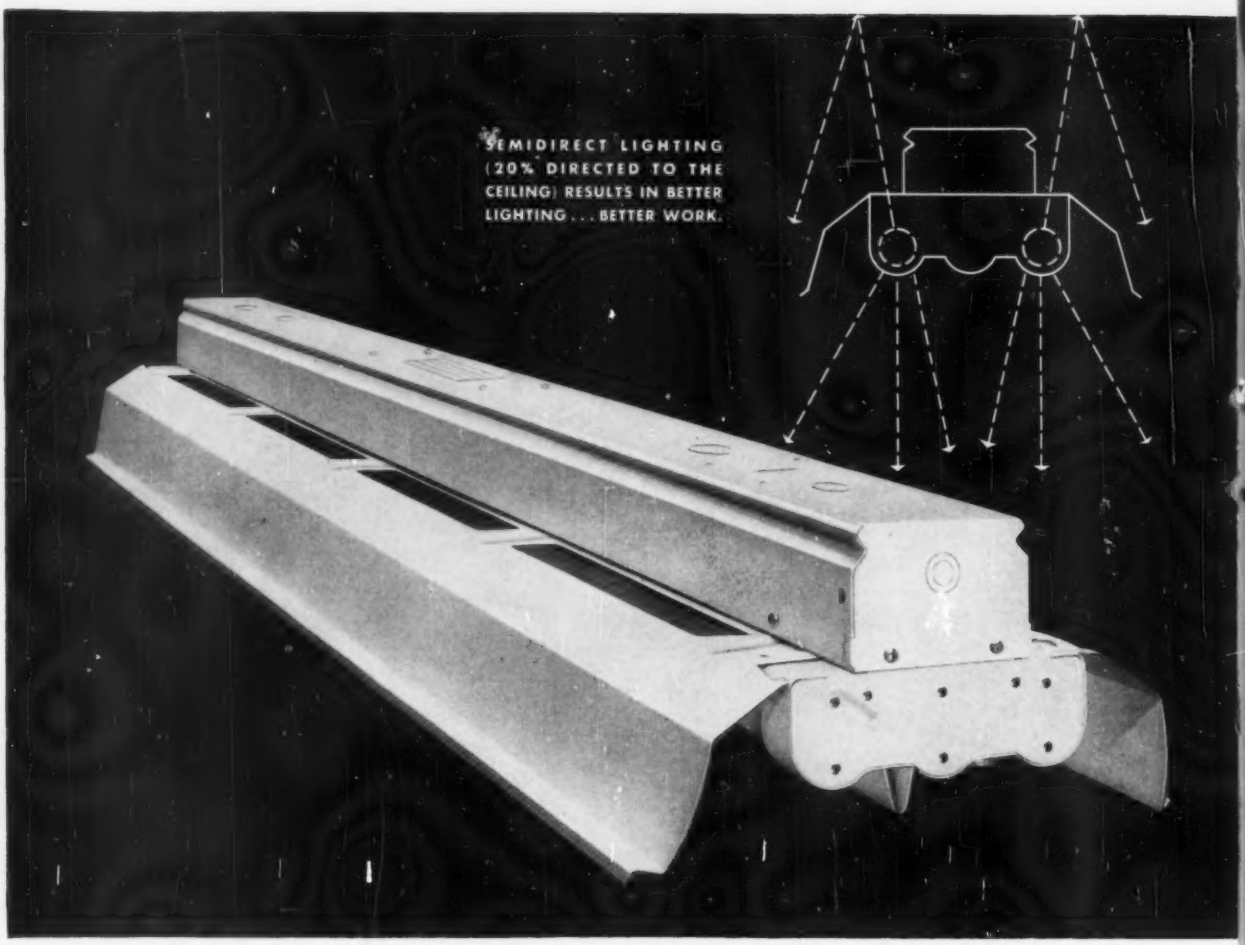

New RLM heavy-duty luminaires assure greater lighting economy

Designed for semi-direct lighting, the new RLM with slotted reflector provides 20% upward component lighting—releasing light that was formerly trapped in this area. And light-colored ceilings now become part of the lighting system—assuring highest illumination levels with better distribution, brightness control and shielding.

But the real lighting economy test is the time and money spent for installation . . . and in operating and maintaining the system at peak efficiency. Luminaire design makes the difference. For instance, with the new Westinghouse RLM heavy-duty luminaire:

Lightweight, completely wired channels mean fast installation. "V" grooves for adjustable slide hangers give flexibility of mounting.

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Heavy-duty, steel-enclosed lamp holders eliminate breakage; and spring-loaded sockets make lamp replacement easy.

Large, easy-to-grip wing locks simplify maintenance by making reflector removal easier.

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To get the full story on this new Westinghouse RLM line, have your Westinghouse distributor bring you booklet B-5644. DP-5008-B

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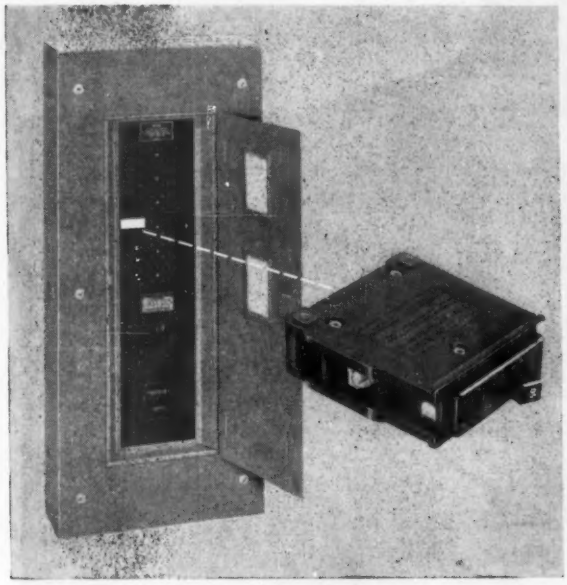
New circuit breaker panelboard gives new low-cost protection



It's the new Westinghouse Type NPLB plug-in panelboard for lighting circuits. And it provides maximum protection at a new low cost through a new AB circuit breaker.

This compact panelboard is of the same quality construction as the well-known Type NPLAB. It, too, features snap-on covers over neutral bar and main lugs, special circuit breaker wiring terminals, permanently visible branch circuit and phase identification.

The new circuit breaker features a quick-make, quick-break mechanism and provides "ON", "OFF" and "TRIP" positions in the operating handle. Mounting arrangements and dimensions are identical to the Quicklag®-P.

A call to your Westinghouse distributor will bring more facts.

New Type MB autostarter has three exclusive features

It brings these distinct and exclusive advantages to provide increased protection and greater savings in man-hours and production time:

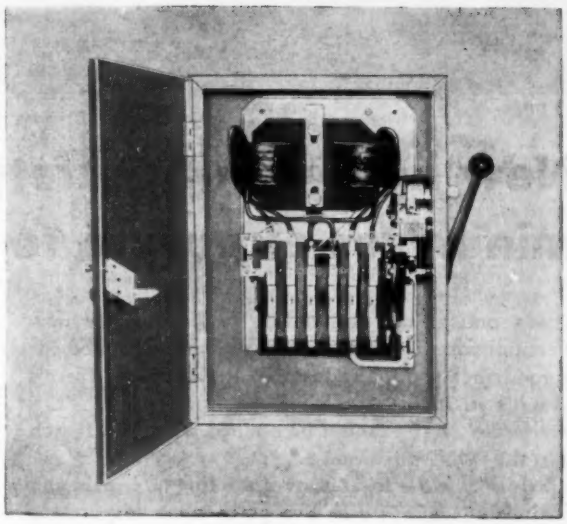
Air brake contacts which completely eliminate the need for oil or oil pans. Double contacts can now be used, slashing maintenance problems. Both features are available in all ratings, 600 volts and below.

A visual signal that indicates when the transfer can be made from "start" to "run" position, eliminating all guesswork in the starting operation.

Performance-proved Type MW overload relays, providing the finest in motor protection. A third MW relay may be added to provide maximum protection on all three phases.

The new autostarter applies wherever across-the-line starting current of squirrel-cage induction motors may exceed local power restrictions . . . or interferes with plant operations. Current inrush is kept within levels, yet maximum starting torque is assured.

DP-5008-C



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New heavy-duty safety switch minimizes exposure to live parts

That's one of the outstanding features of the new Westinghouse Type "H" safety switch—designed for rugged, heavy-duty industrial applications. Here's how it's attained:

Interlocked cover—cannot be opened when the switch is in the "ON" position.

Micarta® shield—located over the line terminals and minimizing exposure to live parts when inspections or fuse replacements are made.

Also, the new Type "H" safety switch has a Neoprene gasket and trunk-type cover latches, making it a NEMA-1A dust-resisting enclosure. All copper parts are tin-plated. And the operating mechanism is contained in a rugged cast handle—leaving side gutters free for wiring.

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a resistance load we may assume 100% power factor and also we may assume balanced load. Each resistance element will actually be connected across 120 volts so that its resistance will be

120/33.2 or 3.6 ohms.

Suppose we connect these to a 3-wire, 240-volt, 3-phase system. The voltage across each resistance element, assuming we still have the three connected in "wye", would be

$240/\sqrt{3}$ or 138½ volts.

The current in each would be

138½/3.6 or 38.5 amps.

The No 8 wires would be ample for this load also.

The power rating of this heater would now be

$\sqrt{3} \times 38.5 \times 240$ or 16,000 watts.

Suppose we reconnect the resistance elements so that they are in a closed delta and assume that they can be operated at this higher voltage. Now each unit will have a current of

240/3.6 or 66.5 amps.

This is the phase current and the actual line current would be

$\sqrt{3} \times 66.5$ or 115.5 amps.

The feeder would now have to be at least three 1/0 type R or three No. 2 Type RH. The power rating would be

$\sqrt{3} \times 115.5 \times 240$ or 48,000 watts.

With reference to the range problem I believe the examples No. 6 and 7 of Chapter 10 cover the installation of single phase ranges. For 3-phase ranges the load calculations would be handled as in the first calculation above, except the demand factors and the neutral size would be taken into account as shown in the various examples of Chapter 10.—B.Z.S.

Column Type Panelboards

Q. *I have a question which involves a 40-circuit column type panelboard which is to have a 12-ft trough extension to a pull box in which is located a neutral bar. According to Section 3624 of the National Electrical Code, a wireway may not contain more than 30 conductors and, therefore, it would seem that this panelboard with its trough and pullbox would violate the Code.*

You are probably aware that a column type panelboard containing a solid neutral bar and 42-circuit protective devices but for which no trough is used, is recognized by Underwriters' Laboratories. Such a panelboard affords very little gutter space for the branch circuit wiring and the connection of conduits to such a panelboard also presents a problem.

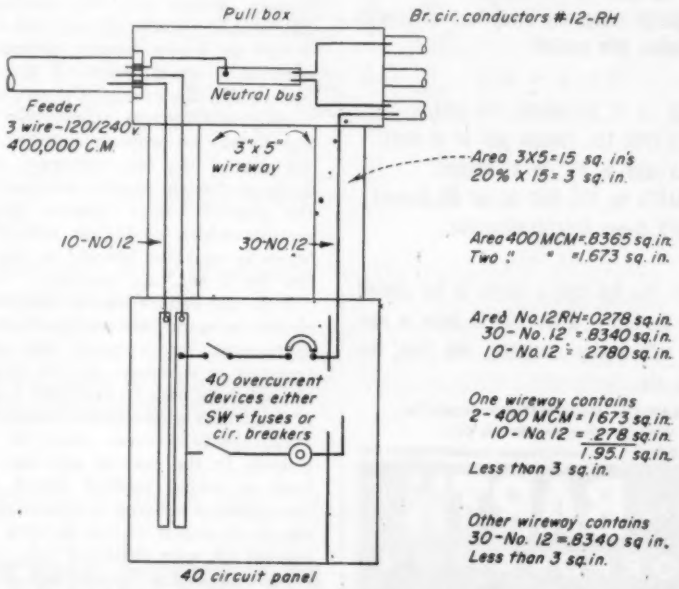
Perhaps you can explain why in one case we are limited to 30 conductors in a wireway which might be approximately 5-in. by 7-in. in cross section, while when no trough is used with a panelboard as many as 85 wires would be permissible in a cross sectional area approximately 5-in. by 7-in.

Will the Code recognize a 40-circuit column type panelboard with neutral in a separate pull box connected to the panelboard by two trough extensions each approximately 3-in. by 5-in. in cross section?—F.X.H.

A. In order to clarify the problem presented, I have shown by the illustration the wiring diagram which I believe you have in mind. In line with the assumptions made with respect to wire sizes, the computations show that 40 No. 12 conductors and two 400 MCM conductors could be installed in the two 3-in. by 5-in. wireways, without violating the provisions of Section 3624 which limits a wireway fill to 30 conductors, provided the fill does not exceed 20% of the cross section area of the wireway. This design, however, which eliminates the neutrals entering either the panel or the wireway, results in a violation of Section 3018 which safeguards the hazard presented by inductive heating which occurs when the conductors of an ac circuit are not arranged so that the induced current in one conductor is neutralized by the current induced in the other conductor of the circuit. A question also could arise concerning the use of a pull box for enclosing the neutral bus. It is therefore my opinion that this method would not satisfy Code requirements.

Assuming that the neutral bus is located in the panel and that the two 3-in. by 5-in. wireways are used, we would have 80-circuit conductors to handle if all circuits were 2-wire and 60 conductors if the circuits were 3-wire. If the panel and the circuits were 3-phase, 4-wire we would have 54 conductors to handle. These circuit conductors would be additional to the three or four feeder conductors. It is evident from the foregoing that the size and number of conductors required is a deciding factor in determining the circuit capacity of a panel when wireways of the size covered by your example are used. In order to clarify the problems presented, I have figured out two examples which show how the use of the wireways and the 40-circuit panel could satisfy the Code when 3-phase 4-wire circuits are used. I have also shown the case of the 3-wire feeder and 3-wire circuits with the 38-circuit limitation.

Let's assume that the circuit loading averages about 15 amps per circuit and all the circuits are 3-phase, 4-wire. In this case the total load served would be 40 circuits times 15 amps or 600 amperes. Divided over the 3 phases this would be 200 amps per phase. A type RH, 3/0 conductor would cover the feeder requirement. Also assume that all 40 circuits are wired with No. 12RH conductors. In this case we have four feeder conductors and 54 branch circuit conductors to handle, a total of 58 wires to be installed in two-in. by 5-in. wireways. The following computation shows how this combination would satisfy Code requirements.



Above arrangement in violation of Section 3018. Inductive heating will result when both polarites of the feeder or circuit are not installed.

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PUSHES 45 Ft. of fish tape per min.
PUSHES around five 90° bends.
STOPS automatically if obstructed.
PUSHES 175 Ft. of .060″ x ¼″ usable highest quality tape.
MAY BE USED in any position.
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PULLS 17 Ft. per minute, full load.
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OPERATES on 115 Volt AC or DC Current.
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SAFE! The fish tape is always in the conduit or in the tool . . never free to come in contact with moving machinery, bus bars, live wires, etc.

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One wireway contains
4–3/0 RH Conductors
24–#12 RH Conductors

Area 3/0 conductor .4151 sq.in.
4–3/0 conductors = 1.6604 sq.in.

Area 1/12 RH = *.0384 sq. in.
Area 24 #12 RH = .9216 sq.in.

Total area used 1.6604 + .9216 = 2.582 sq.in.
Area 1/12 RH = *.0384 sq. in.
Area 24 #12 RH = .9216 sq.in.

Total area available 20% x 15 = 3 sq. in.
Total area used 1.6604 + .9216 = 2.582 sq.in.
*Dimensions of No. 12 RW.

Other wireway contains 30–#12 RH Conductors
Area 30–#12 RH conductors 30 x .0384 = 1.152 sq.in Well within the 3 sq.in area available.

..152 sq.in Well within the 3 sq.in area available.

In the case of a 3-wire 120/240-volt feeder with 3-wire circuits, we would have 60-circuit conductors to handle plus the 3-feeder conductors. This combination would exceed the limitation of 30 conductors per wireway. To satisfy this requirement the circuit conductors must be limited to 57 conductors which is equivalent to 38 circuits. The feeder in this case would be larger since the load per conductor is 300 amps. A 350,000 c.m. conductor, type RH, would be required. The following computations show how such a combination would meet Code requirements.

One wireway contains
3-350,000 c.m. — RH cond's. Area .7620 x 3 = 2.2860 sq.in.
27-No. 12 RH conductors Area .0278 x 27 = .7506 sq.in.
3.0366 sq.in.

In this case the fill slightly exceeds the 3-sq. in. permitted. If there was a question on this point the use of Types T or RU insulation would correct this slight violation. There would be no question if No. 14 conductors were used.

The other wireway contains
30-No. 12 RH conductors 30 x .0278 = .8340 sq. in.
Type RW insulation 30 x .0384 = 1.152 sq. in.

Since the installation of column type panels are in occupancies where 3-phase, 4-wire or 3-wire services are available, it usually follows that either 3-wire or 4-wire branch circuits are used to a great extent. I therefore believe that the examples shown cover usual procedure and indicate that such panels may be properly installed with the use of the two wireways, when 3-phase, 4-wire circuits are used. In the case of 3-wire circuits, the two circuits which could not occupy the wireway could be brought to the pull box by a separate conduit.

I do not believe that a comparison should be made between the Code requirements for a panel and those covering a wireway. In the case of the panel we have to deal with a piece of equipment where factors concerning practicability of use must be considered. In the case of wireways, we have a wiring method which runs throughout a building and involves the use of thousands of feet of wire. The amount of wire installed in a panel represents a small percentage of the total wire in the building. In general, I believe that the degree of safety to be attained by a Code rule must be evaluated, to some extent, from a practical standpoint. What may be desired cannot in all cases be attained especially where equipment is involved.—B.A.McD.

Size of Service for a Home

Q. *When determining size of service for a home, where in the Code will I find the requirement that the basement area also be considered? —T.H.P.*

A. In the second paragraph under subsection a. in Section 2116, you will note the following:

"In determining the load on the 'watt per square foot' basis, the floor area shall be computed from the outside dimensions of the building, apartment or area involved, and the number of floors; not including open porches, garages in connection with dwelling occupancies, nor unfinished spaces and unused spaces in dwellings unless adaptable for future use."

In the modern home today even though the basement may not be finished at the time the building is erected, it certainly is adaptable for future use and therefore must be considered in determining the size of service for the building.—G.R.

Junction Boxes in Accessible Attics

Q. *May branch circuit junction boxes be installed in an unfinished attic which is accessible by ladder through a trap door? I was informed that all wiring connections should be accessible in boxes mounted flush with the finished ceiling on the room below.—C.J.*

A. Section 3717 of the Code reads as follows: "Junction boxes shall be so installed that the wiring contained in them may be rendered accessible without removing any part of the building." The definition of "Accessible" (as applied to wiring methods) reads as follows: "Not permanently closed in by the structure or finish of the building; capable of being removed without disturbing the building structure or finish." Official Interpretation No. 306, issued July 22, 1948 reads as follows:

"Question: With reference to Section 3717, must a junction box when located in an attic be accessible from

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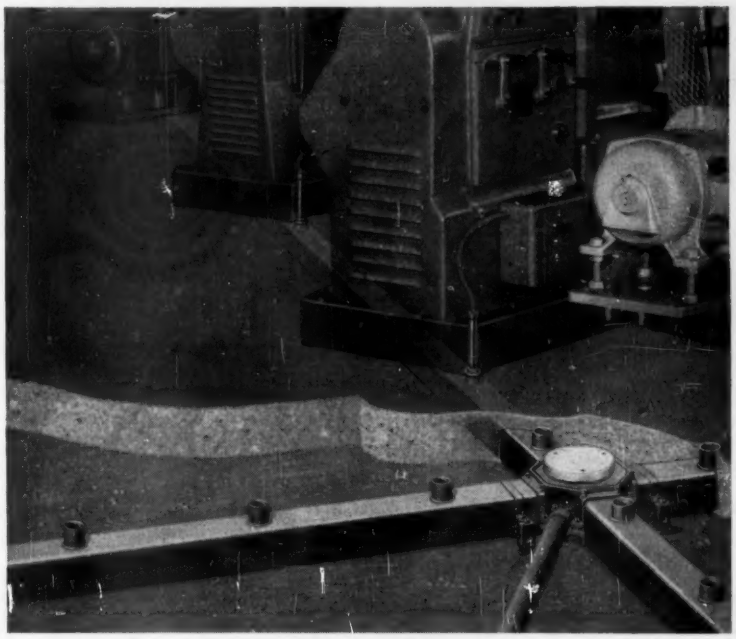

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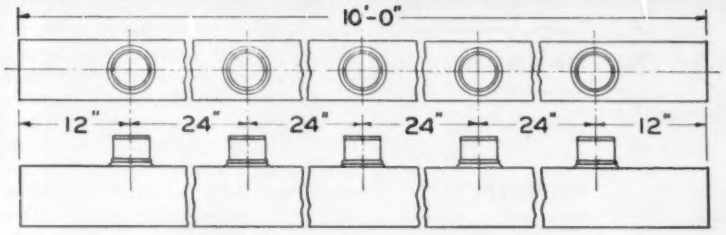

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within the premises if an exterior opening to the attic 'not guarded by elevation' is available?

"Finding: No."

Old Official Interpretation No. 20 given many years ago also applies. It definitely recognizes an attic space with a small scuttle-hole as the only means of entrance as an accessible location.

In view of the foregoing, it appears evident that the junction boxes covered by your question could be installed in the attic described.—B.A.McD.

Green Insulated Conductor

Q. *In Section 2112 of the Code it states that conductors having a green coloring should not be used for other than grounding purposes, but during an inspection trip today I found several dwellings being wired by the same contractor in which he was using a non-metallic sheathed cable containing a green and white wire. What should I do about accepting this job?—O.F.F.*

A. There is always a necessary transition period whenever Code rules are changed and while it has been true for years that a green insulated conductor in a flexible cord must be reserved for grounding purposes, it is also true that it is only in the latest edition of the National Electrical Code that the use of green insulation in cable has been so reserved. It is therefore perfectly possible for a contractor in good faith to buy a cable of the type in question that still contains a green conductor. Of course no more is being made except in multiple conductor cables where a grounding conductor is desired. It would neither be fair nor proper to require the contractor to remove or replace the conductor in these dwellings and we would suggest you recommend he either paint or tape or use colored spaghetti over the green insulation where it enters each box or cabinet.—G.R.

More Table 25

Q. *In the April issue of "Electrical Construction and Maintenance" you had a very informative description of a problem regarding Type "H" motors.*

I have encountered an installation similar to the one described in your article with the following nameplate on motor—7.5 hp—22 amps—220/208 volts—code letter "H" connected to an air conditioning compressor.

*I assume most motors would be wired properly with a 100-amp and 70-amp fuse, but with the type "H" motor I would like to know if Table 25 will supersede Table 20 and if we will need at least a 200-amp switch with a fuse next size larger than 132-amp. How would this affect the branch circuit wire size and the fusing of the main switch on the feeder if this is the largest motor connected to this feeder? Would 300% of this motor plus the full load of other motors satisfy this requirement?—*C.M.A.

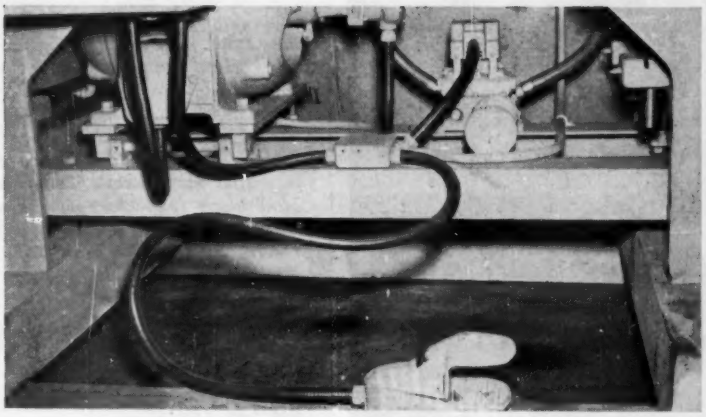
A. It should be noted that Table 25 applies to a specific problem brought about by the use of the hermetically sealed units. In general, the motors in these units run somewhat cooler since they are immersed in the refrigerant. Because of this cooler operation the motor may actually be overloaded (based on its normal loading capacity as a normal operating motor) so that relatively smaller hp motors may be used for specific loads.

Actually, therefore, the hp rating of these motors will not mean a thing as far as designing the electrical system is concerned if the normal hp rating is given. Current values alone will determine the disconnect size, the controller size, the branch circuit conductor size and the overcurrent protective device size.

In the case you cite, the 22 amps is the nominal full load current value for a 7½-hp motor. However, the point in case is to determine the actual full load current for this motor when the air conditioning compressor for example, is operating at rated capacity. Under these conditions the current may still be 22 amps, but in most cases it has been found that the full load current will be higher than this value. For all the old installation, the only way we can determine this current value is to actually measure the current when the unit is in full operating condition. For all new units the code will require sufficient nameplate information to give sufficient data for properly designing the electrical system.

Table 25 will definitely supersede Table 20 for these specific types of hermetically sealed units. In many cases we will now be able to adequately design the electrical circuits, instead of having to tear out the electrical system after we tie in the air conditioning equipment because the system current-carrying capacity is inadequate for the current requirements of this equipment.—B.Z.S.

SEALTITE Flexible Electrical Wiring Conduit makes news



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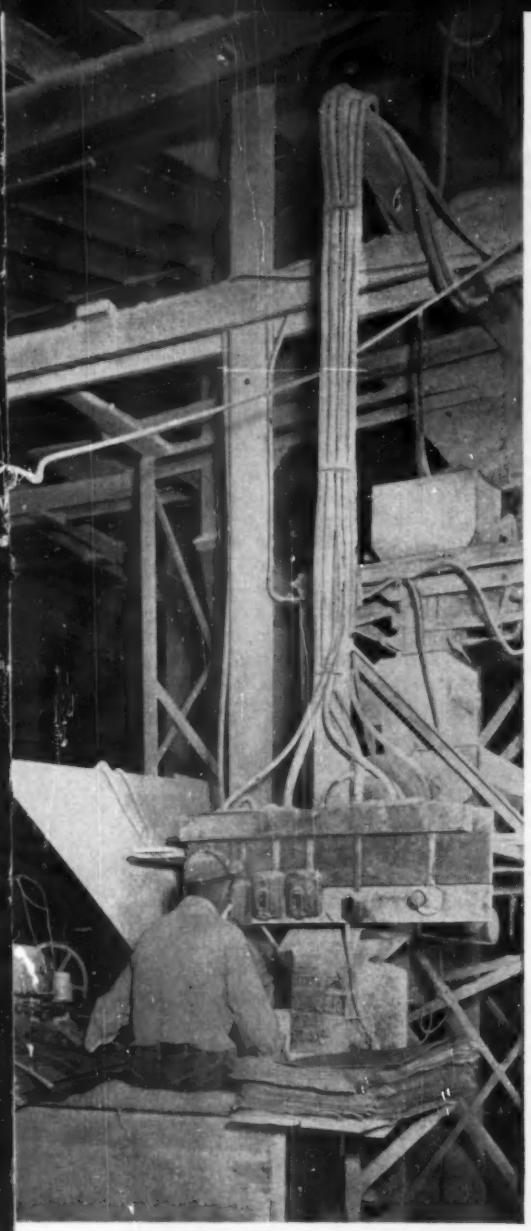

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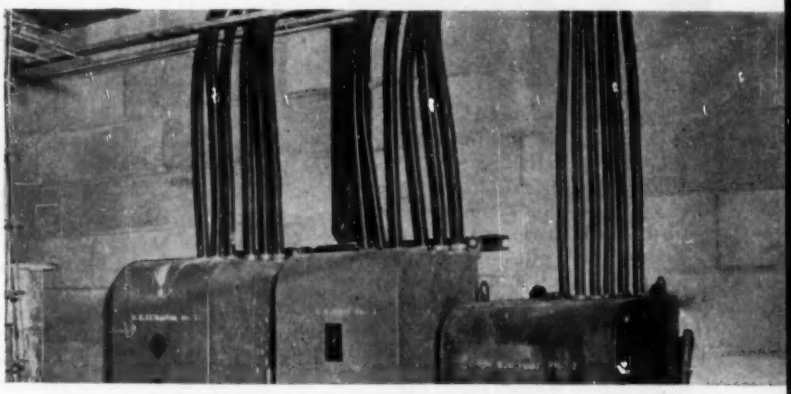

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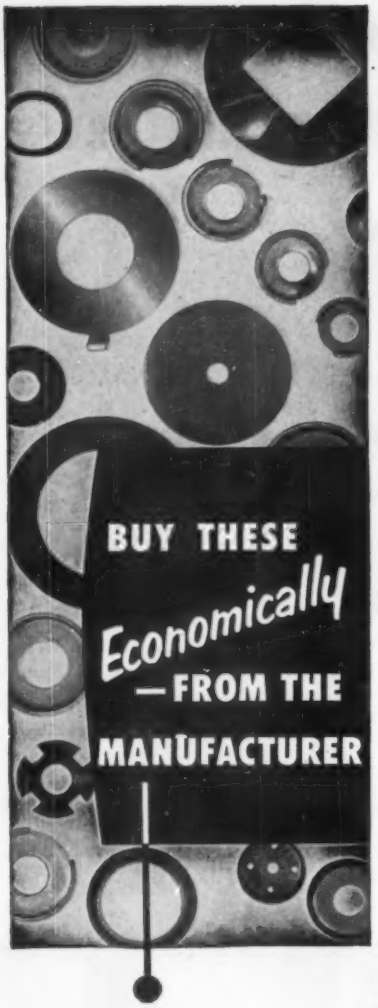

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Q. *As it would take lots of math to figure it out and my boys and I are not good at math and as some of your readers have used the article time and time again, can I get these figures?*

A 1½-in. by 4-in. octagon box with cable clamps and no flush device or fixture studs may contain eight conductors. How many conductors will it contain with a ½-in. raised plaster ring?

A 1½-in. by 4-in. square box, no cable clamps, no flush device or fixture stud may contain 11 conductors. How many conductors may it contain with the following plaster rings?

4-in. raised ½-in. ring reduced to 3-in. with 8/32-in. tapped ears?

4-in. square device cover for single pole switch, 1-gang, ¼-in., ½-in., ¾-in. and 1-in. raised?

4-in. square device cover for single pole switch, 2-gang, ¼-in., ½-in., ¾-in. and 1-in. raised?—D.W.

A. Section 3709 covers most of the points raised in this question.

Basically this section does not give any recognition for additional conductors for raised plaster rings, covers, etc. It would therefore, be assumed that the maximum number of conductors shown in the first table would govern regardless of the type of cover.

However, the third table would indicate that additional conductors would be used. Appleton shows for a 4-in. by 1½-in. deep octagonal box, 16.5 cubic inches inside capacity. It shows a raised ⅝-in. open cover with 3.7 cu. in. The total capacity would be 16.5 plus 3.7 or 20.2 cu. in. With 2 cu. in. allowed for each No. 14 a total of 20.2/2 or 10 No 14s would be permitted.

The ¼-in. plaster ring is not shown but assuming it to be one half of the ⅝-in. ring we have a total capacity of 16.5 plus 3.7/2 or 18.3 cu. in. or a total of nine No. 14 may be used.

For the 1½-in. by 4-in. square we have 17.6 cu. in. or nine No 14. You show 11 so I suppose you mean an 1½-in. by 4-in. square which contains 21.5 cu. in. and does permit 11 No 14s. The ½-in. ring has 3.7 cu. in. or a total of 21.5 plus 3.7 or 25.2 cu. in. At 2 cu. in. per No. 14 we may use 25.2/2 or 12.6 or a total of 12 No 14 (some inspectors may allow 13 since the fraction is over .5).

For the single gang covers we must reduce the body by 1 wire as stated in the paragraph under the second table of 3709. Also it is assumed no fixture studs, cable clamps, etc. are contained in the box. If the cable clamps are inside the box another reduction of 1 wire must be made so that this box with cable clamps inside and with a single gang switch, or equivalent single strap device or devices, can carry only 11 minus 2 or 9 No 14s.

With ¼-in., ½-in., ¾-in. raised covers we add the following capacity: 1.6, 3.2, 4.8 and 6.4 cu. in., respectively. Added to the original 21.5 we have 23.1, 24.7, 26.3 and 27.9, cu. in. respectively, or on the basis of 2 cu. in. per No. 14, we have 12, 12, 13 and 14 respectively. Deducting 2 for the clamps and the device we end up with a net of 10, 10, 11, and 12 No 14, respectively.

For the 2-gang cover we must deduct another conductor for the second single pole device, or single strap device or devices. The ¼-in., ½-in., ¾-in. and 1-in. covers add 3, 6, 9, 12 cu. in., respectively. The total with the box would be, 24.5, 27.5, 30.5 and 33.5 cu. in. respectively. The gross No 14 would be 12, 14, 15 and 17, respectively. The net with a reduction of 3 (2 for the switches and 1 for the clamps) would be 9, 11, 12 and 14 No 14s, respectively.—B.Z.S.

Grounding Cooling Units

Q. *If an air conditioning unit is installed in a window opening of a dwelling, does the code require that the metallic enclosure of the cooling unit be grounded?—T.C.*

A. An Interim Amendment, No. 101, has now been issued to the National Electrical Code to be effective January 1, 1955 which requires that the exposed noncurrent-carrying metal parts which are liable to become energized shall be grounded whenever they are permanently connected to metal-clad wiring, or if in a wet location and are not isolated, or if they are within reach of a person standing on the ground outside of a building, or if they are in electrical contact with metal lath or with metal of any type, or if they operate at more than 150 volts to ground. Therefore, if they are installed in a window opening of a dwelling and are within reach of a person standing on the ground outside, the Code as of January 1, 1955 will require that the metal enclosure be grounded.—G.R.

Plug Type Fuse

Q. *Several issues back, the National Electrical Code used to have a Section 2421 covering the use of plug fuses where permission was granted to use a plug type fuse on a*

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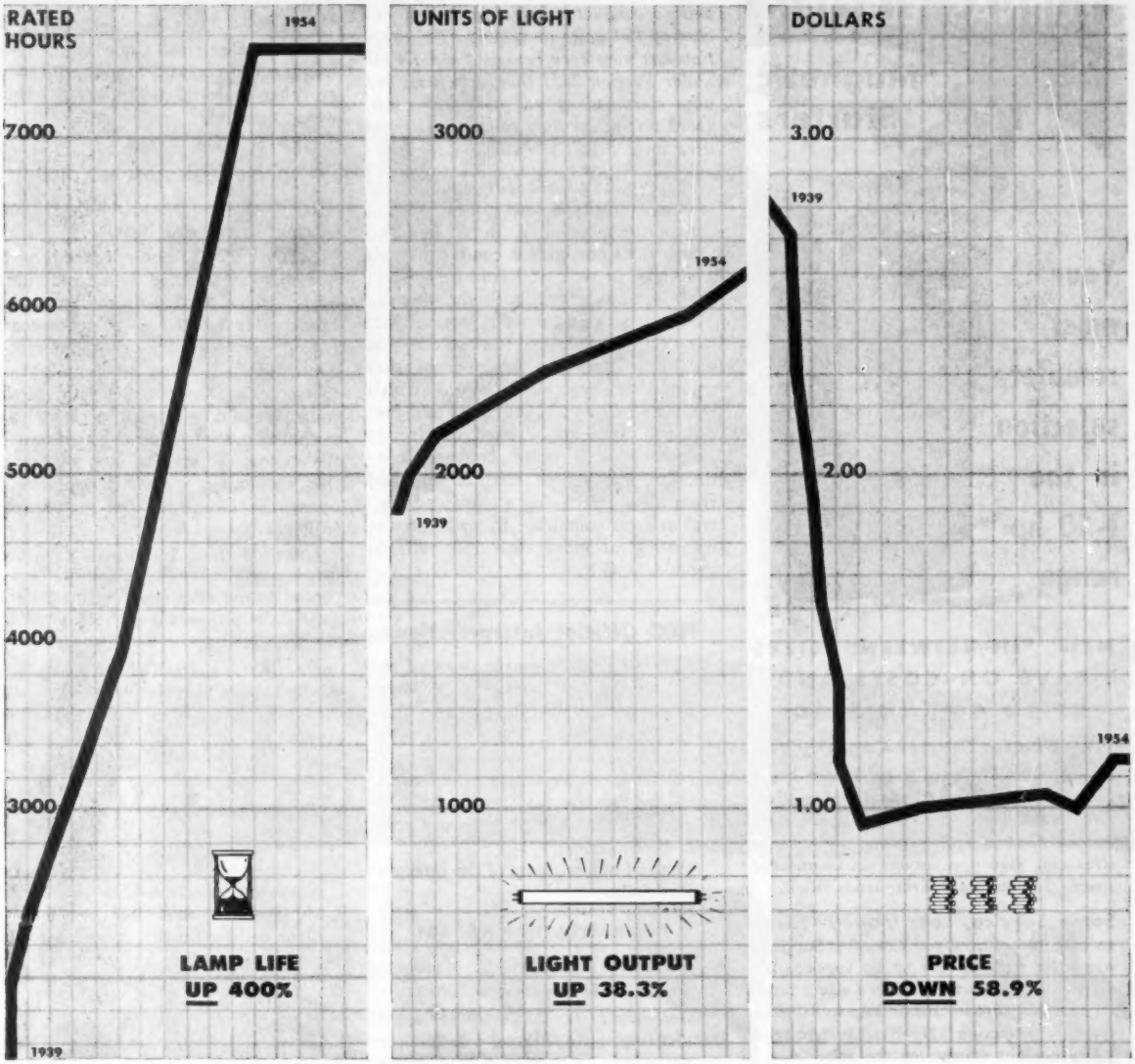

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220-volt circuit provided the building was served with a neutral conductor and no conductor had a voltage in excess of 150 volts to ground. This section has now been removed and I note under Section 2451 that plug fuses are now classified at not over 125 volts. Does this mean they can no longer be used on 230-volt circuits?—J.R.

A. No. The Code still provides that a plug type fuse can be used on any circuit supplied in a building which does not have a conductor with a voltage of over 150 volts to ground that is also served with the neutral. While it is true that old Section 2421 is no longer contained in the Code, you will now find the same permission granted under Section 2403 which reads as follows: "Plug fuses and fuse holders shall not be used in circuits exceeding 125 volts between conductors except in circuits supplied from a system having a grounded neutral and no conductor in such circuits operating at more than 150 volts to ground."—G.R.

NEC Official Interpretations

Four Official Interpretations of the 1953 National Electrical Code have been released by the National Fire Protection Association. These are in addition to the Official Interpretations of the 1953 Code previously released and published by the NFPA in the 1954 edition of the National Fire Codes, Vol. V, Electrical.

The full official texts of the interpretations follow:

INTERPRETATION NO. 404

SECTIONS 4402 and 4328; Protective Devices for Motors

Statement: A hermetically sealed condensing unit, utilizing a two horsepower motor, is protected by a single-pole inherent overheating protective device. The motor and protective device have been tested as a unit and found acceptable. The unit is controlled by a double-pole pressure switch suitable for the application. The supply is 230-volt, single-phase through a double-pole, double-fused, 60-amp, 230-volt, enclosed switch. The switch is within sight of the unit and not more than 10 feet from it.

Question No. 1—May this switch be used as a disconnecting means as required by Section 4402?

Answer—Yes.

Question No. 2—Does Section 4328 prohibit the use of a single-pole inherent overheating protective device as the motor running protection?

Answer—No.

INTERPRETATION NO. 405

SECTION 3464; Conduit Installation

Question—Does Section 3464 of the National Electrical Code require the treatment of conduit threads with paint or other material in order to assure water tightness?

Answer—No.

INTERPRETATION NO. 406

SECTIONS 4409 and 4402; Disconnecting Means For Motors

Statement: A motor exceeding 50 horsepower, supplied by an individual branch circuit is fed through a circuit breaker installed in a panelboard capable of being locked. The motor controller is located within sight of the motor. The control circuit of the controller is connected in series with a pushbutton switch located adjacent to the motor. When the stop button of this pushbutton switch is operated, it opens the circuit to the motor controller.

Question No. 1—May the circuit breaker in the lock-type cabinet be accepted as the disconnecting means and satisfy the provisions of Section 4409?

Answer—No.

Question No. 2—May the pushbutton control switch, which can place the controller in an open position, be considered as the disconnecting means required by Section 4402?

Answer—No.

INTERPRETATION NO. 407

SECTION 4124; Combustibility of Wall and Ceiling Finish

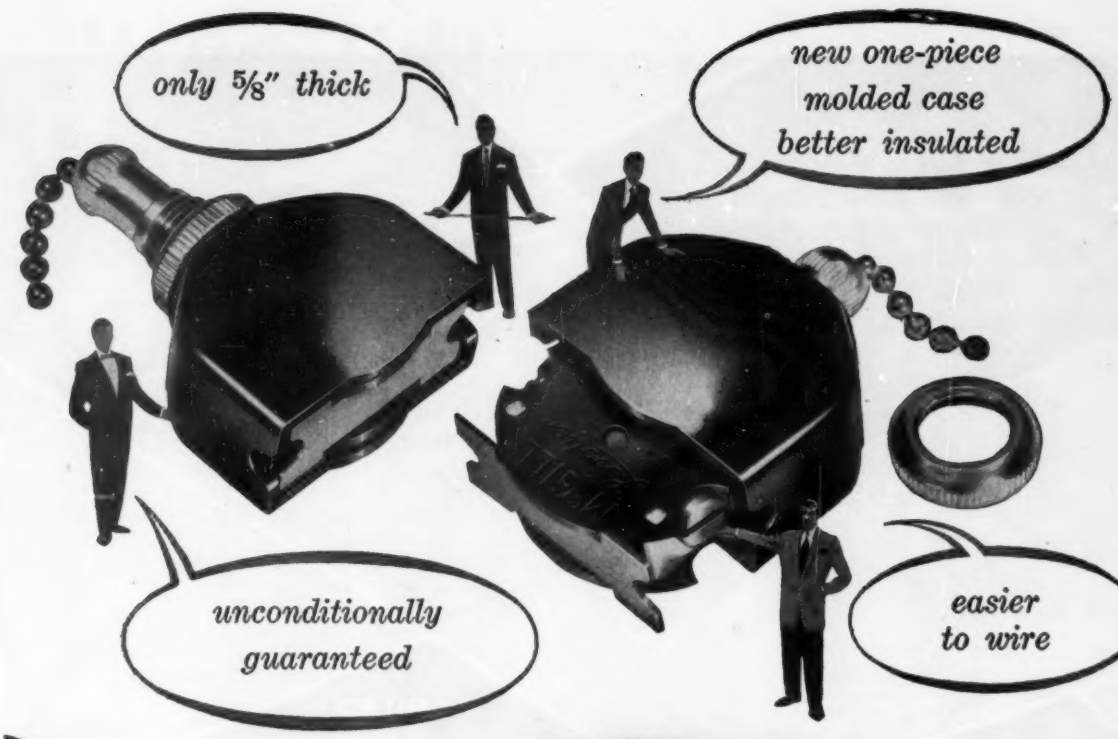
Statement: Section 4124 of the 1953 Code requires that any combustible wall or ceiling finish exposed between the edge of a ceiling fixture or pan and an outlet box be covered with non-combustible material.

Question No. 1—To what extent must the material be combustible to fall within the intent of this section?

Answer—Combustible in the sense used in this section was intended to apply to materials such as wood, wall paper, burlap, and other combustible cloths and plastic fabrics, combustible wall board, and the like to the extent that ignition could be started by an arc or the high temperature of a defective connection. The inspection authority would be expected to make the final determination.

Question No. 2—To what extent would a material have to be non-combustible to fall within the intent of non-combustible as used within this section?

Answer—Non-combustible was intended to apply to materials that would not normally support combustion nor convey flame, such as asbestos, plaster and most metals.



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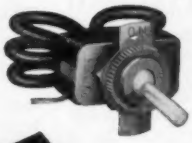

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Pendant-Mounted Open-Top Fixtures for Office Lighting

Reduction of glare and shadows in the office and drafting areas of the Portland Company, Portland, Me., was achieved by illuminating engineer Perley E. Witherbee of the Central Maine Power Company, who recommended the installation of continuous rows of pendant-mounted fixtures on 8-ft. centers. By this method, an average of 90 fc was delivered to drafting tables, with 54 Gill 4-lamp louvered open-top units mounted end-to-end 12 in. beneath the 12-ft white acoustical ceiling. Intensities of approximately 40 fc were provided to desk tops in the office areas by installing 102 Gill 2-lamp units at the same spacing and elevation.

The installation, wired by electrical contractor Henry Rogers of Yarmouth, Me., has the benefit of light grey and buff office furniture and high-reflectivity walls of green (in the office section) and yellow (in drafting sections). Floors are medium green linoleum.

The office, designed by architects Miller & Beal, is additionally lighted during daytime by high windows. This medium and method reduces the amount of light normally reflected from papers atop desks close to exterior walls, yet it permits natural light to extend for a greater distance toward the center of the rooms.

UPWARD COMPONENT of light from open-topped luminous-side louvered-bottom 2-lamp pendant-mounted fixtures minimizes brightness contrast between acoustical ceiling panels and the fixtures themselves, obtains general diffusion, and provides average 40-fc illumination to desks in this office area.

Mercury-Incandescent Combination Uses 1000-Watt Lamps

An average intensity of 30 footcandles is obtained in the high-bay shipping area of a large midwestern electromotive plant, through the use of 1000-watt mercury and filament lamps in combination. Mounted at a height of 36 feet with a 2-way spacing of 24 feet on centers, both types of lamps are contained in Miller fixtures. The H1000-A15s are set in reflectors with open-neck slots to promote air circulation around the lamps, and the filament lamp housings are equipped with glass bottom covers to lessen dirt accumulation on the reflectors and lamps themselves.

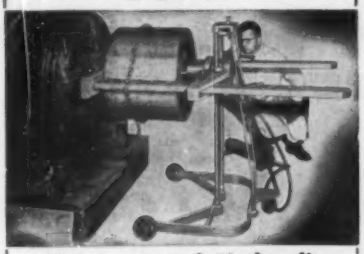
Units are mounted in a staggered arrangement so that each mercury or incandescent lamp is flanked in either direction by a unit of the opposite type. Fixtures are mounted level with the bottom chords of roof trusses and, since the shipping area is served by a travelling crane that operates just below this elevation, maintenance, cleaning and relamping of luminaires can be carried on from a platform erected atop this crane. All fixtures are suspended from the conduit system that carries circuit wiring, and the conduit system in turn is suspended by rod hangers from the roof purlins. Transformers for mercury units are mounted along upper truss chords.

30 FOOTCANDLES is provided to shipping area by alternate-placement arrangement of 1000-watt mercury and filament lamps in Miller reflectors. Spacing of fixtures is 24 feet on centers, while mounting height is 36 feet above floor.

Twin Luminaires Provide Safe Roadway Illumination

A 4-foot-wide centerstrip between two 33-foot-wide single-direction roadways is the location for twin-luminaire poles that are spaced every 110 feet along Bennington Street of East Boston, Mass. Luminaires give medium-width asymmetric distribution (IES Type III) and are mounted 25 feet above the pavement level at the ends of 6-foot tubular steel arms. With 10,000-lumen lamps in service, average illumination on the roadway is 1 footcandle, thereby conforming to IES recommendations for urban streets with heavy vehicular traffic. Glare is minimized by mounting the fixtures

The Quick, Easy Way to Remove an Object from a Shaft!



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Milwaukee, Wisconsin

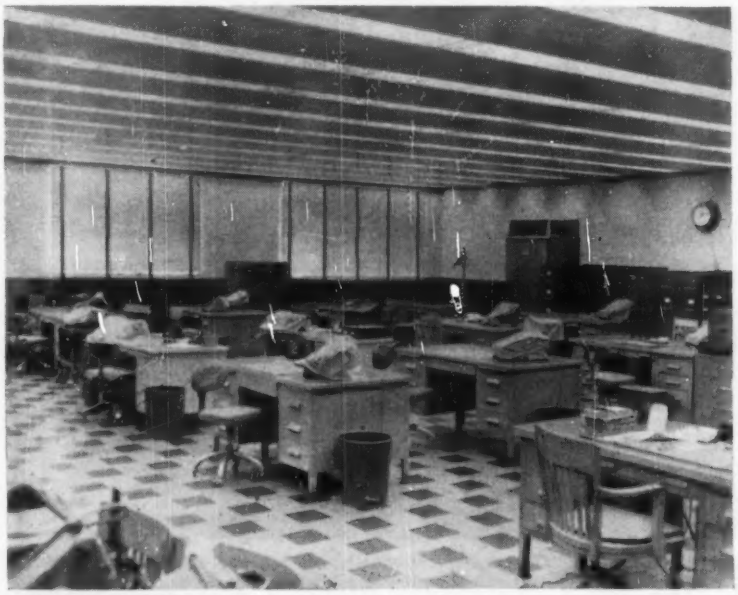
CENTERSTRIP MOUNTING of twin-fixture poles delivers unobstructed light to both roadways in the order of 1 footcandle average. Mounting height of 25 feet places glare of luminaires well above axis of normal visual observance.

well above the normal visual axis of motorists, and evenness of distribution is possible due to the central positioning of poles, unobstructed by foliage. Width of each roadway is such that, even with cars parked along the curb lines, two lanes of moving vehicles can be accommodated in either direction.

Acoustical Ceiling Supported by Lighting Fixtures

Offices of the Attleboro Steam and Electric Company, Attleboro, Mass., have taken on a new look since their inadequate, suspended incandescent lighting fixtures were replaced by continuous fluorescent troffers in combination with a Simplex flush panel aluminum acoustical ceiling.

The suspended ceiling, completely enclosing unsightly overhead water pipes and building beams, was installed as an integral part of the lighting installation by Metters Electrical Company, of Attleboro, avoiding delays normally encountered in scheduling the work of several building trades.



FLUORESCENT TROFFERS provide sole support for aluminum panel ceiling over office area of Attleboro Steam and Electric Co.

1ST FLOOR

2ND FLOOR

New Look

FOR AN OLD BUILDING

...with Lighting by LITECONTROL

This superb remodeling job (in a forty-year-old building) needed custom lighting to show it at its best and provide plenty of balanced light for office work. One versatile fixture — LITECONTROL 4044 — does the job perfectly, lights it just the way everyone wants it.

It's well-illuminated (84 footcandles on the second floor), but even and glare-free. And it's economical on every count.

LITECONTROL 4044 is a louvered fixture that can be used in many ways. Here, it's surface mounted on the first floor, mounted on pendants on the second. It can be hung in rows or individually, as over the door. It goes up easily, is easy to clean and relamp. Louvers swing fully open from either side from spring catches.

LITECONTROL versatility means *custom lighting* with standard fixtures. That means *standard prices.* There are twenty-seven basic fixtures that can be combined or modified to light your job the way you want. For lighting or relighting, call your LITECONTROL representative.

INSTALLATION: Time Credit Office, Union Market National Bank, Watertown, Mass.

ARCHITECT: J. Williams Beal Sons, Boston, Mass.

ENGINEER: Lionel G. Gale, Boston, Mass.

DECORATOR: John H. Pray & Sons Co., Boston, Mass.

ELEC. CONTRACTOR: Howes Electric Co., Watertown, Mass.

FIXTURES: No. 4044 4-lamp 40-watt Bipin-louvered, 35°-25° shielding. Surface mounted (1st Floor). On 4" stems (2nd Floor)

CEILING HEIGHT: 11'-0" (1st Floor) — 10'-2" (2nd Floor)

SPACING: 8'-0" on Centers

INTENSITY: 70 Footcandles average in service (1st Floor). 84 Footcandles average in service (2nd Floor)

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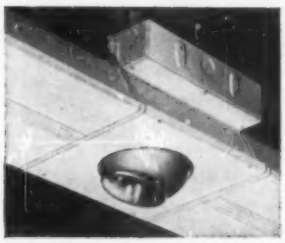
DESIGNERS, ENGINEERS AND MANUFACTURERS OF FLUORESCENT LIGHTING EQUIPMENT DISTRIBUTED ONLY THROUGH ACCREDITED WHOLESALERS

You Get Unlimited Sales Appeal!..

Because *New Sylvania Fluorescent Troffers offer an unlimited number of lighting patterns and effects!*

New Sylvania Troffer with polystyrene shielding for low brightness and wide light distribution. One of the 7 types now available.



Sylvania spot and corner lights accent patterns and harmonize with troffer shieldings.

Put your customers' products in the most appealing, most attractive light. Install new improved Sylvania troffers.

Sylvania Fluorescent Troffers make lighting an integral part of the ceiling, to add sales appeal to the store, and can be arranged in an endless variety of attractive patterns. Available in lengths from 2 feet to 8 feet, Sylvania Troffers come with seven different types of shielding and with instant or standard-start lamps.

In addition, Sylvania offers matching corner spotlights for dramatic accent lighting. New illustrated folder gives complete information and detailed application data. Write Sylvania, Dept. 4X2412, for your free copy now!

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The ceiling consists of anodized aluminum panels one foot wide and in lengths to match the 40-inch spacing of the troffers. The panels, running at right angles to the direction of the lighting fixtures, snap into place between the fixtures.

Office area lighted measures 2500 sq ft; individual rows of fixtures are 48 ft long. Standard warm white slimline lamps in single-lamp troffers furnished an initial intensity of 85 to 100 footcandles.

High See-Ability for Critical Assembly Work

Good lighting is important at the Aro Equipment Corporation in Cleveland, Ohio, where high-altitude oxygen regulators for the Air Force are manufactured under assembly and inspection conditions which, of necessity, must be exacting. There, more than 300 parts (some so small that tweezers and toothpicks are required to handle them) go into each assembly which, when completely assembled, is little larger than an indoor baseball. Thus all assembly operations are critically important and must be carried on under top-flight seeing conditions. Another reason why good visibility is essential in the Aro plant is to facilitate the accurate reading of meters and gauges in constant use seven 12-hour days each week.

For these reasons, high-level shadowless illumination is provided to bench tops by means of 2-lamp 100-watt open-end industrial fluorescent fixtures which are chain-suspended at a height of 6 feet above working surfaces. Lighting directly under each unit betters 140 footcandles, while the sawtooth placement of fixtures tends to eliminate shadows.

SAWTOOTH ARRANGEMENT of 2-lamp industrial fixtures over work benches (with 13 fixtures in each of 8 rows) provides better than 140 footcandles of illumination for critical assembly work.

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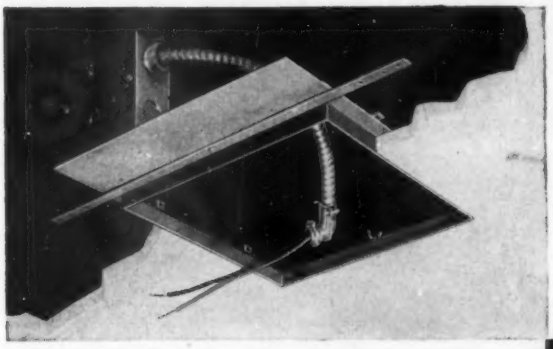
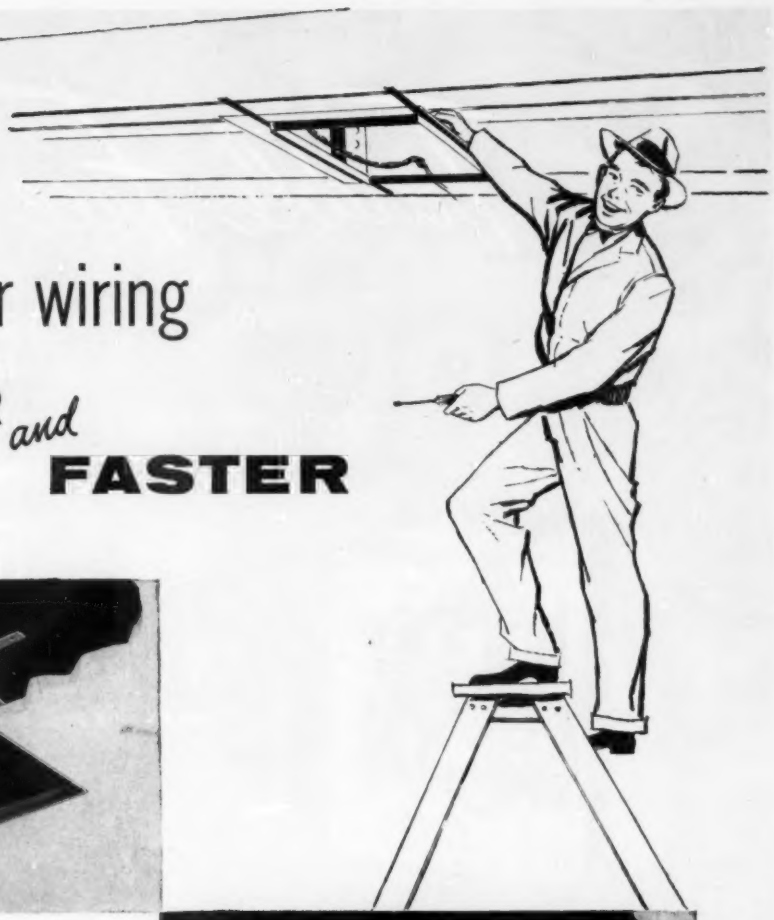
EASIER *and* FASTER





The Binary Plaster Frame of Art Metal units has complete installation equipment including attached junction box, wire, Greenfield and two mounting rails.

Complete specifications on Art Metal pre-wired plaster frame and lens boxes are found in Bulletin 254. We suggest you write for this bulletin . . . it'll show you how to save installation time and money on your next job!

Art Metal recessed lens box housings are easily installed as the job nears completion. Vertical slotted mounting holes provide adjustment for ceiling thickness from ½" to 2".

THE **ART METAL** COMPANY

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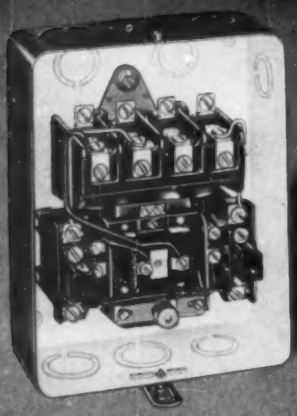
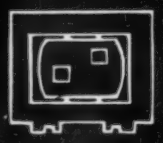
Trouble Free Design

only one moving part—the absolute minimum of wear —guarantees millions of trouble free starter operations



Solenoid Starter, Size 1. Max Rating: 5 hp. 220 v; 7½ hp. 440-550 v.

one moving part



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ALLEN-BRADLEY solenoid starters are trouble free because they have only ONE moving part. Obviously, the more moving parts, the more chances for trouble. Also, the reliable straight up-and-down solenoid motion is frictionless.

The simple solenoid action . . . enclosed arc hoods . . . maintenance free, dependable, double break, silver alloy contacts . . . bonderized cabinet with bright, white interior—are the plus features that you get at no added cost when you install Allen-Bradley solenoid starters.

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In The News

Kansas City Launches Home Rewiring Program

The electrical industry in Kansas City is banding together to break the stranglehold of inadequate wiring on more than 90% of the homes in that area. A well planned wiring modernization promotional program, backed by a $40,000 budget, has as its initial target some 90,000 two-wire, 30-amp service customers on the Kansas City Power & Light Company lines. Cooperating in the program are the electrical contractors (Kansas City Chapter, NECA), the Kansas City Power & Light Company, electrical supply and appliance wholesalers and the Electric Association of Kansas City.

Details of the new Home Wiring Modernization Plan for residential homeowners were revealed at a kick-off dinner meeting attended by more than 70 contractors, wholesalers, utility representatives and other electric association members. The plan, developed by the Association's Adequate Wiring Committee under chairmanship of E. L. Godshalk (KCP&L Co.), incorporates a set of minimum wiring requirements and recommended installation standards plus pay-as-you-go financing payable over a 3-year period on monthly electric service bills.

Basically, the plan will permit any residential customer, living in an established home served by KCPL's Kansas City District, to modernize any existing wiring on his premises and install new wiring from the meter connection. However, the wiring must meet prescribed standards.

Such wiring modernization shall meet the National Electrical Code standards and the following specific local requirements:

1. Installation of a 3-conductor, No. 2, Type RH cable or two No. 2 and one No. 4 conductors in 1¼-in. service conduit (outside to inside connectors). Outside of Kansas City, Mo., service entrance cable of at least two No. 2 and one No. 4 conductors can be used.

2. Removal of meter to outside location.

3. Installation of 100-amp capacity service entrance cabinet with 12 circuit breaker positions. Breakers for six appliance and lighting circuits and a future range circuit must be included.

4. Reconnection and balancing of existing circuit wires in new service cabinet.

LEON HAMPTON, prominent electrical contractor of Longview, Wash., since 1924, assumed the collateral responsibility of president of the T. L. Rosenberg Company, Oakland, Calif., shortly after the death of Teo Rosenberg. In this picture, Mr Hampton (seated) is flanked by four members of his new team. In the usual order, they are Roy Brockman, v.p. and general manager; Walter Smithen, v.p. and chief engineer; Elmer Lago, sales engineer; and Ed Jaffe, secretary-treasurer. Also on the team but not present at the time are Ken Moyle, manager of the shop and motor department; Harold Wolf, senior sales engineer, and John Cain, sales engineer, lighting maintenance division.

5. Installation of adequate ground to street side of water service pipe.

6. Installation of two 20-amp circuits on separate breakers: one in kitchen, one in laundry.

7. Use of No. 12 wire in circuits for all other appliances of 115-volt capacity.

8. Recommendation of No. 12 wire for general lighting circuits.

9. Recommendation of proper and up-to-date lighting fixtures.

The *Recommended Installation* includes, in addition to the above minimum requirements, the addition of an 8-circuit breaker panel (or one 20-breaker panel) to accommodate the following when needed:

A. Water Heater—20-amp circuit.
B. Clothes Dryer—30-amp circuit.
C. Home Freezer—20-amp circuit.
D. Room Cooler (115 volts)—20-amp circuit.
E. Furnace Control—20-amp circuit.
F. Dishwasher and Waste Disposer—20-amp circuit.
G. Air Cooling Unit (220 volts)—20-amp circuit.

All paper involved in the financing will be handled by The First Bancredit Corporation. Terms of up to 36 months with a minimum $5.00 monthly payment can be extended to homeowners. Collection can be made by the KCPL Co. on its monthly electric service bills.

To be active in the program, interested electrical contractors must qualify through the First Bancredit Corporation. The contractor then may enter into an agreement with the qualified homeowner, have the forms signed and credit approved. Following completion of rewiring, both owner and contractor sign completion forms. These are turned over to First Bancredit which processes the paper and notifies the Kansas City Power & Light Company of the job and the monthly sum to be collected (under House Wiring) on the electric bills. KCPL makes the inspection, certifies the wiring and presents the homeowner with a Wiring Modernization Certificate as an indication of the added value the residence now has.

A three-man administration committee will handle the promotional part of the program. This includes John St. Clair representing the Greater Kansas City Chapter, NECA; James M. Stafford, Jr., Kansas City Power & Light Co.; and John S. McDermott, executive manager of The Electric Association of Kansas City. Maintenance of all records and collection and disbursement of funds will be handled by the Association whose address and phone number appear on all promotional material as a source of information.

Promotional activities over a designated 12-month period will include weekly newspaper ads, daily radio spots and periodic TV spots. Direct mail activities, referrals and handouts will include a special brochure with

return postcard and a brochure from the National Adequate Wiring Bureau. KCPL will mail this material to its customers; will also have its service men (on "light out" calls) and salesmen distribute the literature, where feasible, to residential customers.

The immediate and major objective of this program is to make the homeowner conscious of his need for adequate wiring. Ultimately, the Kansas City electrical industry hopes a substantial number of poorly wired homes will be brought up to present day standards. And the electrical contractors are looking forward to the wiring market this program is expected to develop.

Farm Electrification Theme of National Conference

For the purpose of analyzing the need and discussing means for promoting more extensive use of electricity on the farms of our country, representatives from many branches of industry, government, education and the trade press converged on Schenectady, N. Y., last month to take active parts in the 9th National Farm Electrification Conference. General chairman Karl H. Runkle, industry sales manager for General Electric's apparatus division, opened the 2-day conclave with a challenging keynote address and he concluded the program with projected plans for future development of the farm electrification program.

Between these opening and closing remarks were timely talks on: The Need and Use of Market Research, by Victor Hawkins, director of research for Cappers Publications; Effective Selling to the Farm, by Stanley Andrews, executive director for National Projects in Agricultural Communications at Michigan State College; Electrical Safety Knows No Boundaries, by Gerry Moes, manager, Approvals Laboratories, Canadian Standards Association; and What is Being Done About Performance Standards, by J. C. Cahill, farm service coordinator for the Detroit Edison Company.

Panel discussions also were included on such subjects as Electricity Must Pay its Way, Successful Sales and Service by Dealers, and the Purpose and Progress of the Inter-Industry Farm Electric Utilization Council. Moderators for these three panel discussions were Ed W. Mitchell, farm commentator for radio station WGY; J. R. Cobb, manager for power suppliers sales for Frigidaire, and Fred Strong, deputy administrator for the REA. Also highlighted on the 2-day program was an address by Dr. Albert Jorgensen, president of the University of Connecticut, delivered at a banquet held in Schenectady's Van Curler Hotel. All other sessions were held in the auditorium of G.E.'s research laboratory located at The Knolls.

In his opening remarks, Karl Runkle compared the present progress of farm electrification to the industrial revolution of the 1800's, showing how an electrical revolution on the farm is helping to provide more and better agricultural goods than the nation has ever known, bringing to the farmer freedom from drudgery and freedom to produce agricultural goods with new efficiencies. He pointed out that, 40 years ago, coal-oil lamps were the only source of light in 6½-million American farm homes, whereas at the beginning of this year all but 2 percent of the nation's occupied farms have electric service. During the same interval, the number of tractors has increased 153%, milking machines 233% and corn pickers 429%, yet these impressive figures represent only a small fraction of the potential.

Farm Safety Analyzed

O rticular interest to electrical instalation men was a discussion on Canadian safety practices by Mr. Moes, who stated that "the level of safety which can be attained by any group of people depends upon (1) the safety consciousness of the people and their conception of what is considered to be an 'avoidable' or 'unavoidable' type of accident, (2) how much these people are willing to pay to prevent the 'avoidable' accident, either in the form of a more expensive electrical article, or its installation, or inspection service by publiciy-employed specialists on safety, and (3) the effectiveness of the body charged with this safety, and the effectiveness of the laws pertaining thereto."

Mr. Moes also stated that "in general, electrical safety precautions are directed against (1) electric shock, caused by current passing through the body, (2) fire, caused by heating to a degree which will sustain combustion of surrounding combustible materials, and (3) injury, caused chiefly by motion of parts, that is, by mechanical failures. In the farm home these three types of hazards are equal to those in any city or suburban home but, in utility buildings and in the farmyard itself, fire and injury hazards are equal to those in factories, while the hazard from shock is considerably greater."

Mr. Moes then discussed the North American accepted principle of grounding one leg of a 110-volt system, contrasting this practice to the European custom of installing a 3-phase distribution system with the center of the star-connected transformers grounded, giving a voltage of a single phase circuit of 220 volts to ground, or 380 volts between live conductors. Since this voltage really packs a wallop, double insulation is advocated for metal parts of a device coming in direct contact with insulated current-carrying parts. Thus, if a failure occurs between the first two, the conductive casing or frame of the device remains safe.

The Canadian Code, he stated, "insists that approved stationary equipment must be permanently grounded through its conduit, or by grounding wire in non-metallic sheathed cable. This applies to such items as pumping installations, workshop and firewood saw motors, ventilators, conveyors, feed grinders and brooders. On the other hand, portable equipment must have the conductive casings automatically grounded when the device is plugged in. This includes such items as cream separators, milking machines, water pail heaters, welders, animal hair clippers, dehorners and the like."

To promote safety on the farm the Canadian Inspection Department is vigorously advocating (1) driving ground rods at the entrances of all buildings, and several of them where the soil makes a poor grounding medium, such as in rocky areas, and tying them electrically to the copper neutral of the incoming line; (2) isolating, by means of rubber tubing, the piping systems (water, milk) from

NEW IDEAS for selling in rural areas are constantly running through the mind of enterprising Bob Shakstad, Shakstad Electric & Machine Works, Sioux Falls, S. D. Latest is a bright red two-wheel trailer filled with motors and accessories which he tows through the farm areas. A motor in the hand is worth two in a catalog, Bob has discovered when selling rural equipment dealers.

This booklet tells how . . :

This 32-page booklet can help you build or repair apparatus, to operate better at lower cost. Gives properties and advantages, test data, construction drawings, case histories, application details. Also describes the board products and composites.

Quinterra® and Quinorgo® Electrical Insulations lengthen service life...simplify production...cut costs

Quinterra is the pyrolysis-resistant dielectric that helps cut electrical apparatus costs. More and more manufacturers are using it to make apparatus smaller and safer, at lower cost. Its composites are being used in Class "B" and Class "H" motor rewinding. It permits equipment to operate at higher temperatures because it remains a dielectric despite heat and time . . . the bulk of its dielectric strength is in the purified asbestos base sheet. Its mechanical strengths, thinness and flexibility permit economical application.

Quinorgo is the moderate priced, high temperature insulation for use alone or in composites. Designed for operating temperatures up to 130C, it combines high dielectric and mechanical strengths. High in absorption capacity, it can be readily treated and combined with other dielectrics. Furnished only in untreated form.

Send for your free copy now! This new booklet is offered without obligation to electrical equipment designers, engineers, manufacturers and motor repair shops.

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BANG THEM DOWN

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Contractors save time—labor—material with these strong, rugged THIEL Staples. They go in straight and true greatest improvement in staples for cable work (metallic and non-metallic) in 25 years. Send for FREE samples. Sold by Leading Electrical Wholesalers—write for information on open territories.

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ground, and (3) preventing the use of metallic conduit and armored cable in wiring systems in barns and outbuildings.

R.E.A. Service Cited

In discussing effective farm selling, Stanley Andrews stated that for the past two decades, electrical apparatus and appliances have not been *sold* in the full sense of the word by either manufacturers or distributors. Rather, these items have been *bought* by farmers who have gone after the things they needed or wanted. Perhaps that is natural, for the farmer should know best what he needs for his use. Therefore he shouldn't be told what to buy but he should be educated to make wise decisions, and he should be encouraged through easy credit terms and financing arrangements to give greater thought to more adequate wiring and more extensive use of power.

"There are 4,966,000 electrified farms in this country," Andrews declared, "with 2,965,000 of this number served by cooperative and other borrowers from the R.E.A., and the remainder being served by private power industrial enterprises. The emergency-born idea of the R.E.A. therefore constitutes one of the finest examples of a partnership between government and its people to provide a desired and necessary service for the good of the masses. The rural electric line is not something to be merely tolerated, for it is highly desirable."

On the subject of research, Victor Hawkins stated that there were 3072 farming counties in the United States but although electric service was available to the predominant majority, there were still more than 1800 counties in which more than half the power company customers were inadequately wired for efficiency, safety or comfort.

Southern Section IAEI Annual Meeting

The twenty-sixth annual meeting of the Southern Section, International Association of Electrical Inspectors, was held in Tampa, Florida, on October 25-27, 1954. Boasting the highest attendance on record for the Section, in excess of 200 registrations, it was considered a highly successful conference, and a busy three-day affair.

The first session was called to order by Russell A. Miller, chief electrical inspector of the host city of Tampa, who was also general chairman of the Convention Executive Committee.

Joseph E. Snakenberg, Southern Section President, and electrical inspector from New Orleans, La., was introduced by Ben Z. Segall, electrical engineer from New Orleans. Mr. Segall also presented President Snakenberg with the Presidential Gavel in a short and fitting ceremony.

PROPONENT OF good engineering, quality materials and good workmanship is P. W. Frenette, manager, Dakota Electric Construction Company, Fargo, N. D. Adherence to this formula has gained him an enviable reputation in the local electrical contracting fraternity.

Keynote speaker for the annual meeting was B. A. McDonald, IAEI President, who was introduced by past-President W. A. Stall of Jacksonville, Fla. In his presidential address Mr. McDonald paid tribute to the inspectors for their cooperation during 1954 in Light's Diamond Jubilee activities, for their sponsorship of National Electrical Week, and for their acceptance of Canada into IAEI. In pointing up the impact of electrical generation on national growth he said that the American standard of living is the highest in the world, due in large measure to its generation of 43% of the world's electrical power, although its population is only 6% of the world total. Thus the nation's progress parallels electrical progress.

The measure or value of electrical inspection is difficult to appraise, Mr. McDonald pointed out, but it does result in reduction of fire losses and of deaths due to electrical hazards, he said. Records show that fires resulting from electrical defects are usually on non-inspected installations, he reported, and the nation needs to increase its electrical inspection force and scope of work to help reduce still further fire losses and deaths from electrical installations.

Charles L. Smith, IAEI secretary-treasurer, reported on the "Significant Activities of IAEI", reviewed the Association's financial report, told of National Electrical Week activities,

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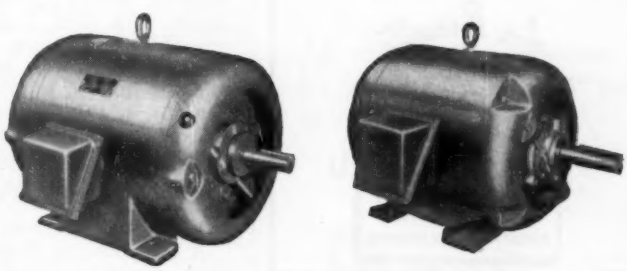

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RELATIVE NEWCOMERS in the electrical construction field are: (L to R) A. M. Solberg and O. H. Pederson, officers of enterprising Edling Electric Company in Moorhead, Minn. Indicative of the young firm's aggressiveness is a ten-fold increase in volume since its organization in 1949.

and reported that the newly-formed Canadian Section recently held its first meeting with more than 200 members present.

Secretary Smith also told of the revision of many pamphlets and reports which have been carried out as a membership service, reviewed the Code revision calendar for the existing 1953 Code, and predicted it would be late 1956 or early 1957 before the new Code revision comes out.

Heard and approved were business session reports from A. M. Miller, Secretary-Treasurer of Southern Section; R. E. Ward, for the Executive Committee; and the 12 Chapter secretaries.

The second session consisted of reports of the general committees, and of the various Panel Code Committees, plus a talk on "Steel Electrical Raceways" by Walter O. Zervas, research engineer, American Iron and Steel Institute, New York City. Mr. Zervas reported the expansion of steel producing capacity from 96 million tons annually in 1946 to 124 million tons annually in 1954. He also said new sources of supply have been found and developed over past several years, and reported on new production techniques, such as ability now to roll silicon sheets to tissue-paper-thickness.

A demonstration of electrical equipment used in hazardous locations was made by G. G. Griffin, District Manager of Crouse-Hinds Co., Houston, Texas.

On the second and third days talks included the following: D. A. White, District Manager of the Okonite Co., Birmingham, Ala., talked on the "Insulating Values in Wires and Cables"; and George S. Jones, Jr., managing director of the Air Conditioning & Refrigeration Institute, discussed "Growth Problems in Air Conditioning".

Presented each day was a session on "Inspection Problems", in which a panel of experts on various phases of the Code were called on to resolve problems brought up by members from the floor. B. Z. Segall of New Orleans moderated these sessions, which proved to be a highlight of the meeting. Inspectors and guests took advantage of the opportunity presented by these sessions to bring up the various problems encountered in their daily work on which they needed assistance in solution, or on which the Code did not seem to present a clear-cut answer.

NISA News

Globe Electric Works, San Francisco, has discontinued its repair business following the death of its president, Lloyd Flatland, last summer.

• • • •

Charles Guy, formerly with Saf-T-Seal Company, has joined the sales staff of Tampa Armature Works, Tampa, Fla.

• • • •

Nimmo Electric, Detroit, one of NISA's oldest member firms, and whose general manager, Charles J. Cannon, was general chairman of the 1954 Convention of NISA, has announced it will discontinue operations Jan. 1. Located near the center of downtown Detroit, the company's building will be razed for a parking lot.

• • • •

Electric Motor Supply Co. moved Nov. 1 from Webb City, Mo. to 215 Wall St. in nearby Joplin, Mo. According to William N. Pickett, president, the move was necessary "due to expansion and increasing business, also to better serve our trading territory."

• • • •

A fourth Ferrari, Robert J., son of Joseph F. Ferrari, Excel Electric Service Co., Inc., Chicago, has joined the firm following return from Army Signal Corps service in Korea and Europe where he held the rank of lieutenant. A Purdue University graduate ('52), Ferrari is currently doing research work for Excel. Later he will work in sales engineering. The other Ferrari's in the firm are Benjamin Sr., brother of Joseph, and his son Ben Jr.

• • • •

The 1955 NISA Convention, to be held in Los Angeles June 6-10, begins on a Monday night with the President's Reception. Although NISA Conven-

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tions usually begin on Sundays, the later date was selected to permit visitors to take advantage of the airlines' "family rates". Wives and children pay only one-half fares when traveling with husbands on Mondays, Tuesdays and Wednesdays. Family groups need not return together, but must leave together.

• • • •

McBroom Electric Co. Inc., of Indianapolis, has announced the formation of a new subsidiary, Edco, Inc., to distribute electrical parts and equipment. Fred McBroom is manager and W. W. Vest, sales manager of the new company with offices at 3303 N. Illinois St.

• • • •

The 150 persons who registered at the October 7-9 meeting of NISA's Southeastern Chapter in Tampa, Fla., agreed it was the most successful in the group's 16-year history. The affair, held at the city's Tampa Terrace Hotel, opened October 7, with a reception, and was called to order officially the next morning by Chapter President J. Arthur Turner, Jr., of Tampa Armature Works, one of the host shops. Howard A. Lilly of Tampa Armature Works, a NISA director, was program chairman for the meeting.

• • • •

Quaker City Chapter held its monthly meeting at Beck's-on-the-Boulevard on October 13. Of special interest at this meeting was a talk and demonstration by Douglas G. Stradeldauer of the Kurt Orban Co. Inc., New York, on the importance of correct balancing of armatures.

• • • •

Electric Motor Service Association of the District of Columbia held its regular monthly meeting September 27 with its new president, E. W. Bishop, Potomac Armature Works, presiding. NISA's vice-president, Joseph H. Previty, Penn Electric Motor Co., Philadelphia, was present at the meeting and spoke on "Pricing Methods".

Other business included the appointment of the following committee chairman: membership committee, M. R. Whipple, ABC Electric Motor Service; publicity committee, Richard Harris, Harco Equipment Corp.; program, public and inter-relations committee, Leon E. Hopkins, Carty Electric & Armature Service, Inc.

• • • •

Southeastern Chapter recently announced the election of the following state directors: Roy E. Shinnault, Roy's Electric Motor Service, Rich-

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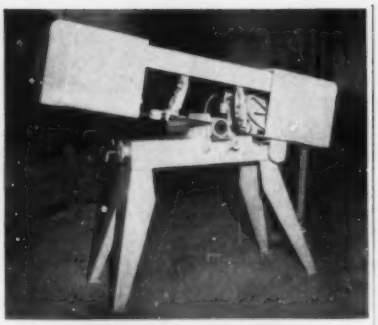

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mond, Va.; Sam S. Johnson, Atlanta Electric Machine Co. Inc., Atlanta, Ga.; George F. Stratton, Armature Winding Co., Charlotte, N. C.; William E. Brunson, Sumter Electric Rewinding Co., Sumter, S. C.; J. Howard Lott, Orlando Armature Works, Inc., Orlando, Fla. They were introduced at the annual banquet of the chapter in Tampa, Fla., October 9.

• • • •

New officers for 1955 were elected by the Los Angeles Chapter at its October 12 meeting held at the Rodger Young Auditorium. New officers are: chairman, Bernard J. Marcus, Marcus Electric Co., Glendale, Calif.; vice-chairman, Russell C. Lockard, Lockard Motor & Pump Co., Huntington Park, Calif.; secretary-treasurer, Marvin A. Clark, Clark Electric Motor Service, North Hollywood, Calif. The evening's program included showing of the new Dow Corning Corp. movie titled "What's a Silicone?" in sound and color. Stan Kessler, Southern California representative of Dow Corning, spoke on "More Profits For You and Your Customers" and illustrated his talk with slides.

• • • •

The quarterly meeting of King Coal Chapter was held September 17 at Evansville, Ind. with the Evansville Electric & Manufacturing Co. as host. The program included a tour of the Hoosier-Cardinal Plastics Plant and an inspection of the Evansville Electric & Manufacturing Co. motor repair shop where the 30 members and guests saw a demonstration of welding techniques.

Highlight of the meeting was the presentation of a certificate to Walter C. Nunn, Swanson-Nunn Electric Co., Evansville, Ind., in recognition of his 50 years of service in the industry.

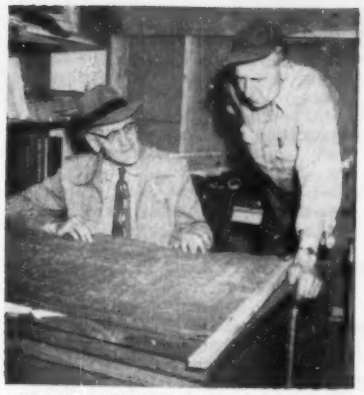
The chapter's next meeting will be in January in St. Louis.

• • • •

San Francisco's Olympic Club was the site of the October 4 meeting of Northern California Chapter. Guest speaker was F. Claverie of Pacific Intermountain Express who presented a color film titled "Wheels of Progress" and spoke briefly on the operations of a trans-continental express company.

• • • •

The following members of Southwestern Chapter were recently appointed to serve on chapter committees for 1954-55: chapter affairs, Paul V. Bush, Lubbock Electric Co., Lubbock, Tex.; membership, John M. Young, Anderson Young Electric Co., Lubbock, Tex.; public relations, Clark M.



PROJECT MANAGER W. F. Bookham (left), Fischbach, Moore & Morrissey, Inc. of Chicago, and his testing supervisor Glen Scott make final check on electrical plans prior to dedication of Standard Oil Company's new refinery at Mandon, N. D. Electrical system was installed for the Lummus Company, refinery designers and builders.

Phippen, J & J Armature Works, Inc., Beaumont, Tex.; rebuilding standards, J. R. Horton, Daley Electric Co., Phoenix, Ariz. and James A. Phares, Southwest Electric Co., Oklahoma City, Okla.; trade relations, J. M. Morgan, Central Electric Co., Fort Worth, Tex.

• • • •

The N. Y. Metropolitan Chapter had a meeting on October 21 in the lounge of the Hotel Shelburne. H. Engelmann presided.

After dinner, Walter Leirer, President of Queens Electric Motors, Inc., Jamaica, N. Y., delivered a talk on the subject "Cost of Repair Jobs", then proceeded with the explanation of what costs consist of, and gave a demonstration of how records of job costs are kept in his company. The very lively and long discussion that followed Leirer's presentation shows that great interest exists on the part of members in this very important topic.

On November 11, N. Y. Metropolitan Chapter held a regular meeting. Main event of the meeting was the presence of the National President G. E. Jones, who delivered a short talk. The members greatly enjoyed the opportunity to meet the president and good spirits prevailed on this occasion. Two guests from New England Chapter appeared at this event, Jack Reddington of Boston, past president of New England Chapter, and D. A. Davis of the Hartford Electric Machine Co. Horst Orbanowski of K. O. Co. Inc., presented a talk on new imported dynamic balancer, which concluded the meeting.

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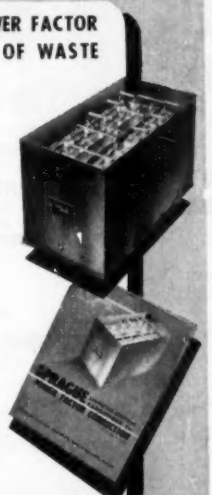

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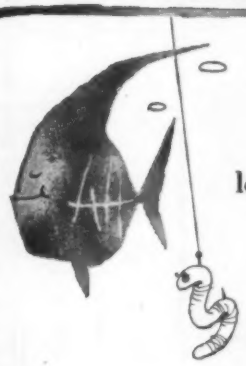

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DATES AHEAD

Plant Maintenance & Engineering Show—International Amphitheatre, Chicago, Ill., January 24-27.

International Heating and Ventilating Exposition — Commercial Museum and Convention Hall, Philadelphia, Pa., January 24-28.

American Institute of Electrical Engineers—Winter general meeting, Hotel Statler, New York, N. Y., January 31-February 4.

National Rural Electric Cooperative Assn. — Annual meeting, Atlantic City, N. J., February 14-17.

National Electrical Manufacturers Assn.—Edgewater Beach Hotel, Chicago, Ill., March 13-18.

Illuminating Engineering Society — Regional Conferences (1955): Southern—Fort Harrison Hotel, Clearwater, Florida, March 31-April 1; **Southwestern** — Gunter Hotel, San Antonio, Texas, April 3-5; **Inter-Mountain** — Phoenix, Arizona, April 11-13; **South Pacific Coast**—Statler Hotel, Los Angeles, California, April 14-15; **Pacific Northwest** — Harrison Hot Springs Hotel, Harrison Lake, British Columbia (Canada), April 25-26; **Midwestern** — Edgewater Beach Hotel, Chicago, Illinois, May 2-3; **Canadian**—Mount Royal Hotel, Montreal, Quebec (Canada), May 12-13; **East Central**—Abraham Lincoln Hotel, Reading, Pennsylvania, May 19-20; and **Northeastern**—Fort William Henry Hotel, Lake George, New York, June 10-11.

Chicago Electrical Industry Show—Third biennial exhibit sponsored by the Electric Association of Chicago in cooperation with the Electrical Maintenance Engineers of Chicago, Conrad Hilton Hotel, Chicago, Ill., May 10-12.

National Fire Protection Assn.—59th annual convention, Netherland Plaza Hotel, Cincinnati, Ohio, May 16-20.

National Industrial Service Assn., Inc.—Annual convention, Hotel Statler, Los Angeles, Calif., June 5-9.

Illuminating Engineering Society—National Technical Conference, Statler Hotel, Cleveland, Ohio, September 12-16.

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Among the Manufacturers

Headquarters Announcements

Electro Engineering Products Co., Inc., Chicago, Ill.—Howard G. Jacobsohn, president; David E. Bright, chairman of the board.

Allen B. DuMont Laboratories, Inc., Clifton, N. J.—Robert E. Kessler, manager of the Communication Products Div.

Federal Pacific Electric Co., Newark, N. J.—E. A. Williams, manager of Eastern Switchgear Div., which has opened a new plant in Scranton, Pa.

General Electric Co., Pittsfield, Mass.—William S. Ginn, general manager, Transformer Div.

Thomas & Betts, Elizabeth, N. J.—John C. Kaufmann, product manager for sales of cast connectors.

Square D Co., Detroit, Mich.—C. Howard Brittenham, plant manager of the Iowa National Mfg. Co., Cedar Rapids, Iowa, a new subsidiary.

Anaconda Wire & Cable Co., New York, N. Y.—David E. Allen, Charles H. Porter, and Maurice J. McCarthy, vice presidents; H. V. Van Valkenburg, sales manager; C. B. Peck, Jr., industrial sales manager; H. E. West, contractor sales manager.

Sylvania Electric Products Inc., New York, N. Y.—Chalmers J. Carothers, Jr., sales manager for special products of the Lighting Div.

Amplex Corp., Brooklyn, N. Y.—Robert M. Freeman, general sales manager.

United States Rubber Co., New York, N. Y.—G. Allen Lovell, assistant general manager of Mechanical Goods Div.

Youngstown Sheet & Tube Co.,

INSPECTORS Joseph N. Murray of Everett, Mass., and Frank Lints, of Quincy, Mass., visited the exhibitors' booths together at the annual meeting of the Eastern Section, IAEI, Atlantic City, August 30-Sept. 1, 1954.

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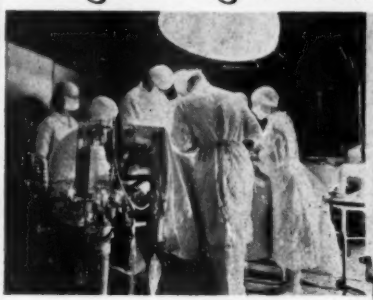

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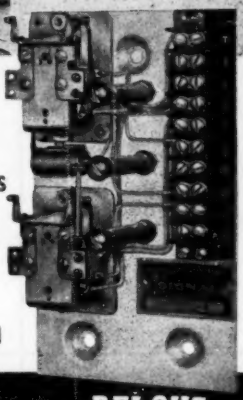

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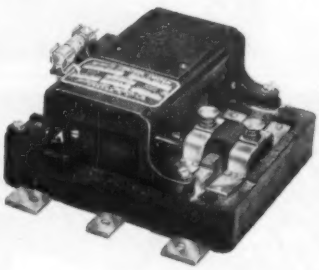

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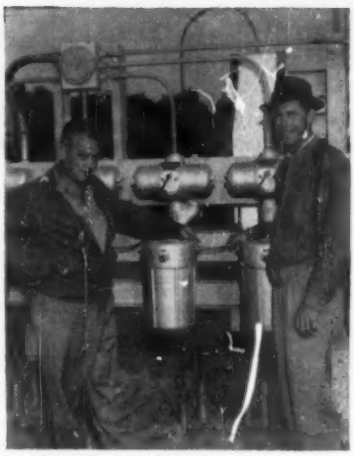
Automatic Switch Co.

385Q LAKESIDE AVENUE, ORANGE, NEW JERSEY



CHECKING MI CABLE installation on outdoor explosion-proof starter rack are: (L to R) Russell N. Gibson, project superintendent for Commonwealth Electric Co. (St. Paul, Minn.) and Thomas K. Milligan, project engineer for Standard Oil Company at Standard's new pipe line terminal near Sauk Centre, Minn.

Youngstown, Ohio—John M. Tuthill, general sales manager.

McLean Engineering Laboratories, Princeton, N. J.—Roger T. Lyman, sales manager.

Star Expansion Bolt Co., Inc., New York, N. Y.—Harry Fox, vice president in charge of sales.

Peerless Electric Co., Warren, Ohio, has purchased the physical assets of the Sherman Electric Co., Inc.

Mathias Klein & Sons has relocated to 7200 McCormick Rd., Chicago.

Okonite Company, Passaic, N. J. has adopted a new Selected Distributor Plan for its Tape Dept. Features of the plan are a well-defined return goods policy, price protection, new packaging styles and extensive product promotion.

Jefferson Electric Co., Bellwood, Ill.—Joseph G. Solari, vice president in charge of sales; John J. Brogan, sales manager; J. J. Archibald, assistant sales manager.

General Electric Co., Bridgeport, Conn.—Ralph C. Dean, manager of sales operations for the Construction Materials Div.

Ilsco Corporation is the new name of Ilsco Copper Tube & Products, Inc. of Cincinnati, Ohio.

Corning Glass Works, Corning, N. Y.—George W. Douglas, manager of lighting sales.

Regional Appointments

MIDDLE ATLANTIC

Electric Storage Battery Co., Exide Industrial Div.: R. L. Kegg, branch sales manager for Pittsburgh, Pa.

Mitchell Manufacturing Co.: J. H.

SEARCHLIGHT SECTION

(Classified Advertising)

EMPLOYMENT — BUSINESS EQUIPMENT — USED OR RESALE

OPPORTUNITIES

UNDISPLAYED RATE
(Not available for equipment advertising)
$1.20 a line, minimum 3 lines.
POSITIONS WANTED undisplayed advertising rate is one-half of above rate, payable in advance.
Box Numbers—Count as one line. Replies mailed same day received.
Discount of 10% if full payment is made in advance for 4 consecutive insertions.

DISPLAYED RATE
The advertising rate is $11.00 per inch.

REPLIES (Box No.): Address to office nearest you
NEW YORK: 330 W. 42nd St. (36)
CHICAGO: 520 N. Michigan Ave. (11)
SAN FRANCISCO: 68 Post St. (4)

POSITION VACANT

ELECTRICAL ENGINEER or experienced repair man familiar large AC-DC work, take charge of 7 man shop and handle sales new and used motors. Good future for right man. P-4610, Electrical Construction & Maintenance.

SELLING OPPORTUNITY OFFERED

WANTED ELECTRICAL Sales Engineer to travel Indiana, Ohio, Illinois, Southern Michigan. Make take-offs and handle bid follow-through on line of industrial and commercial electrical distribution equipment. Car, salary, bonus, expenses. Possible future sales management. Daly Equipment Co., 111 143rd St., Hammond, Ind.

U. S. Government

Sealed bids for furnishing labor, equipment, materials and performing all work required for site preparation, construction of substation, installation of all equipment and accessories, other related work, will be received in the office of the Engineering and Construction Director, Balboa Heights, Canal Zone, until 10:05 A.M. January 3, 1955, and at that time publicly opened. Plans and specifications are available at the office of Procurement Officer, Panama Canal Company, 21 West Street, New York 6, N. Y. Deposit of $40.00 required.

ELECTRICAL CONTRACTORS ESTIMATING HANDBOOK
"A Unique Tool of the Trade"
WRITE FOR DESCRIPTIVE FOLDER TO
THE ESTIMATOR PUBLISHING CO.
4102 Wilson Road Kenosha, Wis.

RADIANT HEATING PANELS
in perfect condition at a bargain.
10—1000 W, 230V, glass heating panels, with four Mercoid thermostats, and transformer relays, for zone heating of houses, motels or other buildings.
FS-4765, Electrical Construction & Maintenance
330 W. 42 St., New York 36, N. Y.

ELECTRICAL WIRE AND CABLE
—Your Best Source—
- for every industrial and power application
- Odd lengths—long and short—reasonably priced
- **LARGEST STOCK IN MIDWEST**

Let us quote on requirements—send your inquiries
We'll also buy your Surplus
Branch Offices:
Houston—Yukon 5847 Los Angeles—ANgeles 3-5148
UNIVERSAL Wire and Cable Co.
2662 N Clybern Ave., Chicago 14, Ill.
EAstgate 7-4777 Code: UNIWIRE

Davidson, district manager for N. Y., N. J. and Connecticut area.

SOUTH ATLANTIC

Mitchell Manufacturing Co.: D. B. Jones, district sales manager for Md. and the District of Columbia; territory will also include eastern and central Pennsylvania as well as southern New Jersey.

EAST CENTRAL

General Electric Co.: Charles R. Shields, manager of the north central sales district of the Construction Materials Div. with offices in Chicago.

Automatic Control Co.: J. S. Williams, field engineer for Minnesota, the Dakotas and western Wisconsin.

Anaconda Wire & Cable Co.: Ernest B. Miller, Jr., manager of the Chicago sales district.

Youngstown Sheet & Tube Co.: P. G. Boyd, western manager of sales; C. Hix Jones, and David H. Goodfellow, district sales managers for Chicago and Detroit.

Electro Silv-A-King Corp.: Gerald M. Marks, Illinois area district manager; T. A. Malady, district sales representative for Louisiana, Mississippi and Mobile, Ala.

Electric Storage Battery Co., Exide Industrial Div.: Charles H. Leet, assistant branch sales manager for the Chicago, Ill., office.

Graybar Electric Company, Inc.: G. L. Call, sales manager for the Cincinnati district; E. I. Funk, branch manager, Akron, Ohio.

Allen-Bradley Co.: James L. Howarth Co., sales representative for Alabama, offices in Birmingham.

WEST CENTRAL

General Electric Co.: Vernon Hagman, central regional field sales representative for the Air Conditioning Div., offices in Kansas City, Mo.

Line Material Co.: Allan Steitz, manager of new Oklahoma City, Okla., office.

Amplex Corporation: Kenneth Carr, western divisional sales manager.

Anaconda Wire & Cable Corp.: John N. Ratcliff, Jr., Houston, Texas, district sales manager.

WEST

Benjamin Electric Mfg. Co.: Oliver C. Westburg, Pacific Coast division manager; G. A. Hochenauer, manager of sales in southern California and Arizona; John Keyes, central district manager covering northern California, Utah, Nevada, and parts of Idaho; Henry Huber, sales manager for the Oregon, Washington, Montana, and northern Idaho district.

All-State Welding Alloys Co., Inc.: Harry G. Peacor, regional manager for the Northwest.

WHERE TO BUY

Equipment, Materials, Supplies and Services for Electrical Construction—Maintenance—Repairs

VERSATILE . .
WODACK DO-ALL
Electric Hammer and Drill

SAVES MONEY . . . turns out more work . . . cuts costs! A contractor writes: "We used the Wodack Combination in putting up a climber fence, drilling holes 4" to 5" deep. It did wonderful work. Cut our cost 80%."

WODACK is versatile! Drills concrete floors—brick and stone for expansion bolts—channels concrete floors—drills metal and wood—chips mortar joints. Attachment for right angle drilling. Chips cracks for plastering, cuts holes and openings in walls. *12 to 15 times faster than by hand!*

REQUEST BULLETIN 510-EC

WODACK ELECTRIC TOOL CORP.
4627 W. Huron St., Chicago 44, Ill.

FAMOUS
Mend-it-sleeve

Permanently splices broken wires and coils in electric appliances, automotive and industrial equipment. Make repairs and splices quickly, cheaply. 5 Sizes.

Just insert wire ends and crimp tight with ordinary pliers.

WRITE FOR CATALOG & FREE SAMPLE

MEND-IT SLEEVE MFG. CO.
136 Bonita Ave. Piedmont 11, Calif.

STOP that WATER
With FORMULA NO. 640, a clear liquid which penetrates 1" plus in concrete, brick, stucco, plaster, etc. Seals out water, dirt. Holds 20' head. Use outside and in. Preserves all absorbent materials. Sold 14 years. Quick, economical, sure. $3 in 55's. Free sample. See Sweet's.
HAYNES PRODUCTS CO., OMAHA 3, NEBR.

ROBOT OPERATORS
OPEN - CLOSE - LOCK DOORS, GATES
. . . *Electronically*

COMMERCIAL, INDUSTRIAL
RESIDENTIAL & SPECIAL
Write for Catalog
ROBOT APPLIANCES, INC.
7041 ORCHARD - DEARBORN, MICHIGAN

A GOOD Habit

The Where-To-Buy Section of Electrical Construction and Maintenance supplements other advertising in this issue with these additional announcements of products and materials of special interest and application in the field of electrical construction, maintenance and repair work. Make a habit of checking this page each issue —a good habit!

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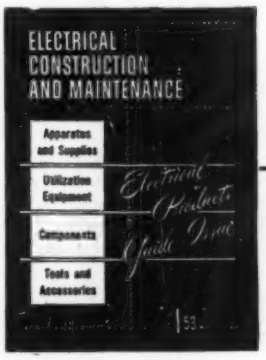
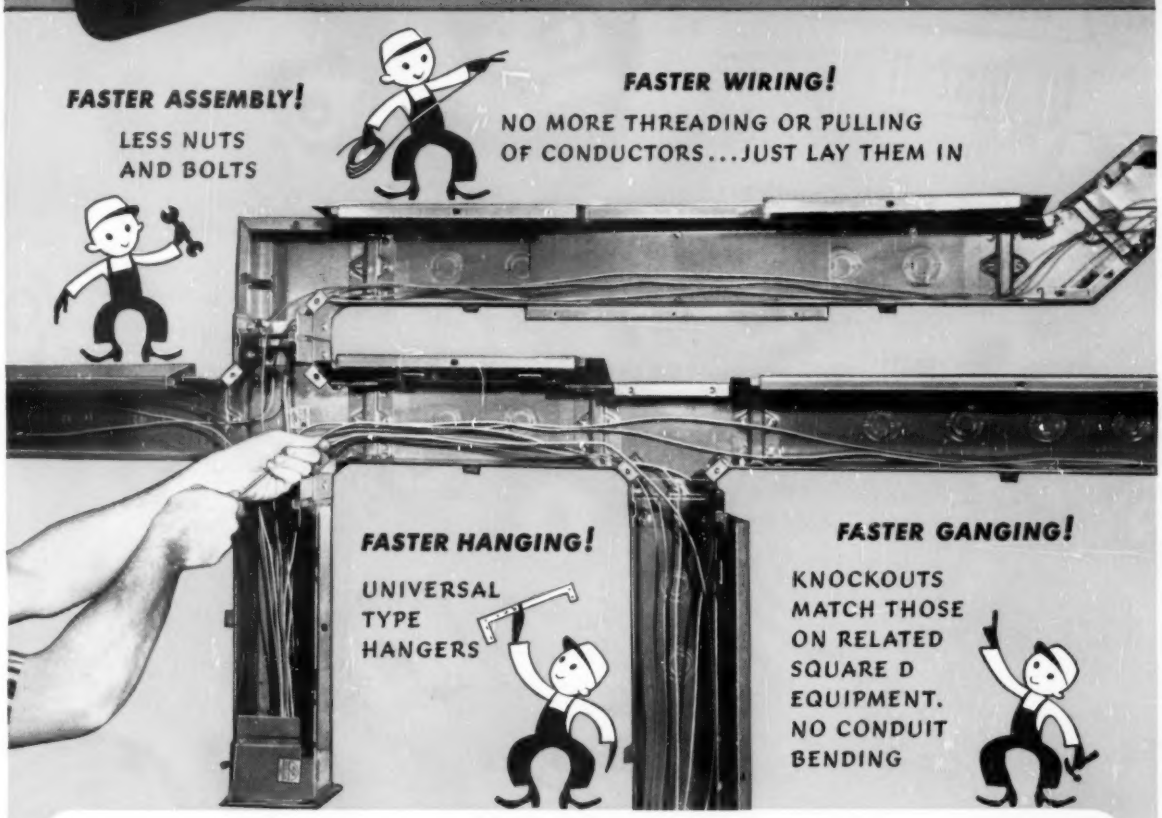


• These manufacturers advertised their products in the ELECTRICAL PRODUCTS GUIDE

For more complete information, and application data on their lines, refer to the index of Advertisers in the ELECTRICAL PRODUCTS GUIDE . . . the 13th issue of ELECTRICAL CONSTRUCTION AND MAINTENANCE.

INSTALL WIREWAYS FASTER!

SQUARE D's NEW AND EXCLUSIVE *Lay-in Duct*


FASTER ASSEMBLY!
LESS NUTS AND BOLTS
FASTER WIRING!
NO MORE THREADING OR PULLING OF CONDUCTORS...JUST LAY THEM IN
FASTER HANGING!
UNIVERSAL TYPE HANGERS
FASTER GANGING!
KNOCKOUTS MATCH THOSE ON RELATED SQUARE D EQUIPMENT. NO CONDUIT BENDING

Square D's exclusive design provides hinged covers for both the duct sections and connectors. Easily removable fitting covers then provide a completely unobstructed wireway in which to lay wires.

LAY-IN DUCT is available in 2½" x 2½", 4" x 4", and 6" x 6" sizes, in standard lengths of 1, 2, and 5 feet. There is a complete line of fittings, all with the "lay-in" design feature.

• • •

Write for the complete story of **LAY-IN DUCT**—how it gives you a better wireway system, easier, faster and at less cost. Address Square D Company, 6060 Rivard Street, Detroit 11, Michigan.

ASK YOUR ELECTRICAL DISTRIBUTOR FOR SQUARE D PRODUCTS

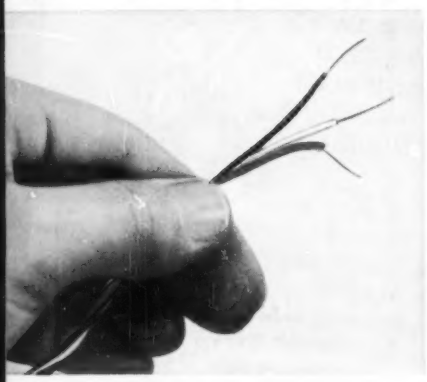
SQUARE D COMPANY

"G-E REMOTE-CONTROL WIRING is easy and economical to install"

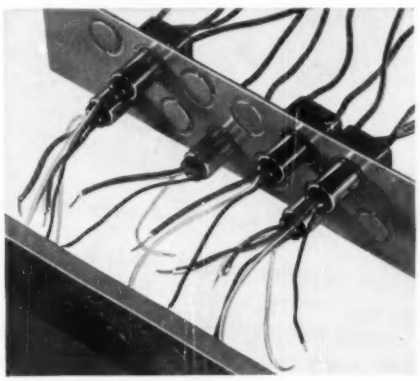
says: William Maley, manager
Tico Electric Company
McKeesport, Pennsylvania

Tico Electric has completed more than 100 installations of remote-control wiring and has contracts for 150 more houses. Mr. Maley thinks that "G-E remote-control wiring is the most modern method of wiring." Tico gives its customers the extra conveniences of remote-control—*at little, if any, additional cost.*

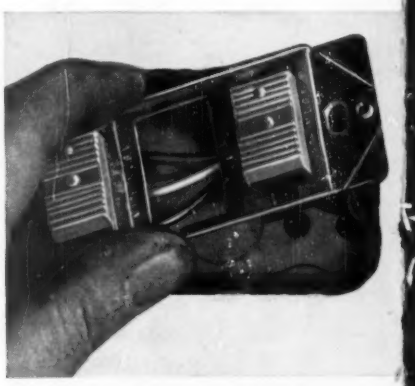
Now you can offer your customers the benefits of this new wiring system. For detailed information, write for the "G-E Remote-Control Manual Of Layout And Installation," Section D119A-1218, Construction Materials Division, General Electric Company, Bridgeport 2, Connecticut.



IT'S AS EASY to connect up the remote-control wiring system as it is to wire a doorbell. The lightweight, color-coded wire is flexible and strips cleanly.



REMOVABLE DIVIDER in new RGB boxes simplifies ganging up to twelve relays for zone grouping. Relays operate on safe 24 volts; pigtails are color-coded.



WALL SWITCHES (shown above) control individual circuits. . . . Selector switches control up to 9 circuits. . . . New Circuit Servants control up to 25 circuits.

Progress Is Our Most Important Product

REWIRE AMERICA
WITH GENERAL ELECTRIC WIRING SYSTEMS

GENERAL ELECTRIC